

Chapter 5--Oral Surgery

Overview

Introduction

It takes time for a dentist to become an expert exodontist. The practitioner must be familiar with many surgical procedures and adhere to a set of principles to provide the best possible treatment for his patients. This chapter discusses these procedures and principles.

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Section A--Principles of Oral Surgery

Overview

Introduction

Oral surgery is a surgical discipline which requires strict adherence to a set of principles in order to provide the best possible results for the patient. Surgical principles are the guidelines considered necessary in the light of experience for the successful completion of a surgical procedure with minimum morbidity. It takes years of experience to become an expert exodontist, and those who do must make these principles second nature.

Categories of Principles

The principles of oral surgery are grouped into the following four categories:

- preoperative evaluation
- exodontia
- surgical techniques
- contraindications for tooth extraction

Preoperative Evaluation

Introduction

Prior to any surgical treatment a thorough preoperative evaluation should be performed.

Procedures for Preoperative Evaluation

Follow these steps to perform a thorough preoperative evaluation. A discussion of each of these steps follows.

Step	Action
1	Perform an initial assessment by obtaining a concise medical and dental history.
2	Perform a physical examination by examining the entire oral cavity for <ul style="list-style-type: none"> • the condition for which the patient was referred • any abnormal conditions
3	Obtain a panoramic radiograph of the patient.
4	Develop a surgical plan

Initial Assessment

Patient treatment starts with the initial assessment. The most important thing that we do to avoid any problem is to carefully check the patient's ability to tolerate the surgical procedure. A concise history is obtained to determine whether preexisting medical or dental problems might affect the planned procedure. The review of the history should reveal the patient's reason for seeking dental care and describe previous dental experience. Thus, the old adage "Never treat a stranger" should be part of our normal preoperative evaluation.

Physical Examination

A physical examination should precede any surgical intervention. The entire oral cavity should be examined for

- the condition for which the patient was referred
- any other abnormal conditions

Radiographs

Radiographs of good quality are imperative to evaluating the condition. They also reveal the--

- root formation and curvatures
- pathology
- position of the inferior alveolar canal and maxillary sinus

The standard intraoral dental radiograph provides greater clarity of detail than does a panoramic radiograph, but the panoramic radiograph is more useful for a general radiographic survey of the maxilla/mandible and teeth. For oral surgery the panoramic radiograph has almost completely replaced the full set of intraoral dental radiographs; although occasionally the panoramic view may be supplemented with selected intraoral views if additional detail is required.

Surgical Plan

The surgical plan includes a determination of the patient's

- **general management.** This asks:
 - Should treatment be in the hospital or dental office?
 - Is medical consultation indicated?
- **surgical management.** This asks:
 - Are preoperative antibiotics indicated?
 - Should the tooth be sectioned for ease of removal and anesthetic needs (e.g., local with or without vasoconstrictor).

Fundamentals of Exodontia

Introduction

Exodontia, tooth extraction, requires careful consideration of the following elements:

- analgesia
- asepsis
- instrumentation
- lighting
- surgical assistance
- hemostasis

Purpose of Analgesia

Complete and profound local analgesia is an absolute necessity in oral surgery procedures. Intravenous sedatives do **not** provide local analgesia.

Methods of Analgesia

Each patient should be evaluated as an individual and the method of pain control carefully selected.

- Some people can be adequately treated with local anesthetics.
- Others need to have general anesthetics.

Warning: All anesthesia is obtained at a price. There is some potential for risk and morbidity associated with every type of anesthetic, including local analgesia. The highest risk and morbidity occurs with general anesthetic, and diminishes progressively from deep IV sedation, to conscious sedation, and finally to local analgesia. Thus, an effort should be made to keep your anesthetic technique to the simplest form.

Purpose of Asepsis

A plan for aseptic technique should be strictly adhered to by all personnel associated with exodontia procedures. Even though the oral cavity is considered a contaminated field in terms of surgical asepsis, the dentist must be careful not to introduce additional microorganisms into the patient. Although a patient may have acquired a tolerance for the organisms of his own oral flora, he may be highly susceptible to those of another.

Methods of Asepsis

For this reason, the dentist and all dental personnel must be constantly vigilant to avoid cross contamination from one patient to another or from yourself either directly or indirectly by means of some intermediate object such as a

- light
- headrest/chair adjustment lever
- pen
- telephone

Asepsis Tools

These are only a few of the several possible weak links in the aseptic techniques of exodontia. Using the following items helps to circumvent these areas:

- masks
- protective outerwear
- sterile gloves

- sterile light handles
- sterile suction tubing on each tray
- eye protection

Autoclaving for all instruments is the method of choice.

Instrumentation

Instrument selection is frequently a matter of personnel preference. You should prepare in advance several trays containing a standard assortment of sterile surgical instruments (including those instruments needed to perform the surgical removal of third molars). You can add specific instruments needed for the surgical procedure to the following standard instruments in this tray:

- **sterile surgical dental handpieces.** An adequate number of sterile surgical dental handpieces is essential so that a freshly sterilized handpiece can be used for each patient.
- **fissure and round burs.** Numbers 702 and 703 fissure burs and numbers 6 and 8 round burs are excellent for removing bone and sectioning teeth. (These burs can also be used for smoothing the bony margins around and inside an extraction socket.)
- **bone file.** A standard bone file is helpful in smoothing an edge in a place inaccessible to a bur.
- **forceps.** The proper use of forceps promotes the efficient removal of teeth with a minimum of discomfort and tissue damage. Extraction forceps are designed to fit the anatomical shape of the crown and root of specific teeth and for the application of specific forces on individual teeth in different anatomical positions. There are many types of forceps available; all are variations of two basic designs:
 - straight-handled forceps used for anterior teeth
 - curved or bayonet handled forceps used for posterior teeth
- **elevators.** Elevators are also very useful in the removal of teeth and minimize the discomfort and tissue damage. However, they should be used with care because serious complications can occur when they are used improperly. Most problems with elevators stem from misjudgment of the amount of force delivered or from improper placement.

Lighting

Brilliant light 100 percent of the time in the operative site is an absolute must. Sometimes the

dental light is inadequate and a headlight proves more beneficial.

Surgical Assistance

It has been said that a well-trained surgical assistant can make the doctor's surgical technique look good. The reverse, unfortunately, can also be true. It is folly for a dentist to expect to perform an oral surgical procedure neatly, carefully, and with complete control of the situation without a surgical assistant to retract and suction.

Purpose of Hemostasis

To have good visualization of the surgical field you must be able to remove blood from the surgical field and control the bleeding. The first step towards hemostasis comes long before the first drop of blood is shed. It comes while taking the history.

Special Concerns with Hemostasis

Patients taking anticoagulants and those with a history of bleeding problems require special attention before, during, and after surgery. This includes--

- stopping certain medications
- medical consultation
- careful tissue management
- removal of granulation tissue
- packing sockets and sutures

Surgical Technique Fundamentals

Introduction

Careful treatment of soft tissue and bone results in minimal postoperative pain, swelling, bleeding, and disability. The following principles cannot be over-emphasized if the surgery is to be as atraumatic as possible. The surgeon must--

- have access to the operative field
- have an unimpeded path for removal of the tooth
- use controlled force

Access to the Operative Site

- Access to the surgical field is accomplished by--
- positioning the patient to allow for optimum exposure
- using good lighting
- having the assistant suction the field as necessary
- controlling bleeding in the field
- reflecting a flap/removing appropriate amounts of bone whenever necessary. (A properly developed flap will afford you maximum access to the field. A flap will heal much better and faster than a torn, traumatized area of tissue.) If developing a flap does not permit access to the operative site, then bone must be removed.

Note: You will be more likely and less hesitant to develop a flap if you have anesthetized a broad area around the surgical site and have the necessary instruments readily available on your surgical tray.

Unimpeded Path for Removal of Tooth

The path for removal of a tooth must be unimpeded. Malpositioned, impacted, and deeply carious teeth frequently do not have a clear path for removal. They may be blocked by an adjacent tooth and/or overlying bone. Multi-rooted teeth often have curves in the roots which may be blocked by bone, or the distance between the roots may be too wide for removal through the tooth socket.

Obtaining an unimpeded path of removal means removal of bone and/or surgical sectioning of teeth or roots. Controlled tooth division is an important phase of exodontia. Sectioning of teeth when indicated reduces trauma and prevents complications from the use of excessive force (e.g., sinus exposure, fracture of the maxillary tuberosity or mandible).

Controlled Force

The force used to remove a tooth must be under control at all times. The force used with rotary drills must also be carefully controlled. The surgeon has to develop a feel for the amount of bone removed by the drill, use of light pressure, and be careful to protect the adjacent tissues. Brute or uncontrolled force is unnecessary and must be avoided in exodontia.

Contraindications for Tooth Extraction

Introduction

Tooth extraction is often contraindicated. Contraindications include those local to the extraction or those systemic to the patient. These contraindications can be relative or absolute depending on the general condition of a patient. You must weigh these contraindications against the benefits of the extraction.

Local Contraindications

Local contraindications for tooth extraction include the following conditions:

- presence of oral sepsis

When oral sepsis is present (e.g., acute necrotizing ulcerative gingivitis, herpetic lesions, gingival stomatitis, or acute generalized gross oral sepsis from any cause), you may choose to delay exodontia.

- radiation therapy to maxilla/mandible. Previous radiation therapy to the maxilla/mandible is a relative contraindication for the removal of teeth. It is preferable to remove teeth with a poor prognosis before radiation therapy. However to retain an abscessed tooth in an irradiated maxilla/mandible may also be contraindicated. Endodontics is preferred to extractions when possible. An oral surgeon should be consulted before treatment.
- acute dental infection

When an acute dental infection is present, you must consider the patient's general condition before extracting a tooth. A patient in a toxic condition with a fever should be treated differently from an afebrile, but otherwise well patient, although both have a dental infection with local or spreading inflammation. The primary objective is to limit the spread of infection and return the patient to good health. Your choices include--

- administer antibiotics, drain the abscess if indicated, and then reschedule the patient for removal of the tooth.
- immediately remove the tooth to eliminate the source of the infection, establish drainage, and limit the spread of the infection.

Good judgment is the key as to whether to proceed with the extraction or postpone it if there will be considerable cutting or bone removal. You must also consider the difficulty of the extraction.

Antibiotics are especially indicated when there are systemic symptoms (e.g., elevated temperature, lymphadenopathy, trismus, and pain when swallowing) or when the patient is compromised by systemic disease.

Systemic Contraindications

Systemic contraindications for tooth extraction may include the following conditions:

- uncontrolled medical disease

Any uncontrolled medical disease may be considered a contraindication to tooth extraction. Such conditions include severe hypertension (diastolic pressure ≥ 115 mm Hg), uncontrolled diabetes (blood glucose >250), severe anemia, leukemia, severe liver disease, or patient with alcohol withdrawal syndrome. Certain blood dyscrasias such as hemophilia require proper medical management before extractions can be performed.

- pregnancy

Elective surgery should be postponed until after the pregnancy. If extraction is necessary, generally the second trimester of pregnancy is the preferred time for dental procedures. With proper obstetric consultation, extractions can often be done at any stage of pregnancy. Care should be taken to position the patient properly (not lying flat on back) and to avoid extremely stressful situations.

Warning: Local anesthesia should be used. Nitrous oxide is contraindicated.

Section B--Facial Fracture Diagnosis

Overview

Introduction

Dental Officers stationed at IHS facilities are likely to be called upon for diagnosis, treatment planning, and/or management of facial fractures. Many cases can be treated on an outpatient basis by simple closed reduction, but others require hospitalization and more complex procedures.

Responsibilities

It is the responsibility of the general dentist to diagnose the fractures and decide whether treatment will be rendered at the field facility or if referral is necessary. When the diagnosis of a facial fracture has been established, it is the responsibility of the dentist to make treatment planning decisions leading to the proper disposition of the case. Do not attempt to treat these cases if you have not had training or experience in their management.

It is not within the scope of this manual to provide a cookbook method of treating and managing facial fractures. Those who do provide this must have additional training through advanced general practice residencies or special courses in fracture management.

Diagnosis

You can diagnose a facial fracture that requires treatment on a clinical basis. To perform a thorough diagnosis of facial fractures, you should--

- obtain a complete dental history and history of the events surrounding the injury
- perform a physical examination
- perform a radiographic examination

History

Introduction

Before treating a patient, it is important to determine the events and circumstances that led to the injury. You must also obtain the past medical and dental history.

Determining the Events and Circumstances

When determining the events and circumstances that led to the injury, you should ask the questions:

- How?
- When?
- Where?

You should then document these findings in the chart.

Physical Examination

Introduction

The physical examination is the most important part of an evaluation for facial fractures. Always perform the physical examination prior to obtaining radiographs. If a physical examination fails to reveal signs of fractures, e.g., mobility, malocclusion, displacement, etc., a fracture may be present, but it may not require treatment beyond diet management and close follow-up.

Stages

The physical examination consists of two stages as follows:

Stage	Description
1	Extraoral Examination. Dentist performs extraoral examination of the patient. (See steps 1 through 5 of Physical Examination Procedures.)
2	Intraoral Examination. Dentist performs intraoral examination of the patient. (See steps 6 through 13 of Physical Examination Procedures.)

Physical Examination Procedures

Follow these steps to perform a thorough physical examination.

Step	Action
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<i>Extraoral Examination</i>					
1	<p>Visually examine the following areas for evidence of lacerations, swellings, etc.:</p> <ul style="list-style-type: none"> • scalp • face • neck <p>Note: Do not overlook the occipital region in a patient who is supine on a stretcher.</p>				
2	<p>With gloved hands, palpate the above listed regions looking for areas of tenderness, swellings, etc.</p>				
3	<p>Palpate the following structures simultaneously:</p> <ul style="list-style-type: none"> • bony landmarks of the facial skeleton (using right and left hands) • bilateral structures 				
4	<p>Examine the following areas:</p> <ul style="list-style-type: none"> • supraorbital rim • lateral orbital rim • infraorbital rim • zygomatic body • zygomatic arch • nasal bridge 				
5	<p>Palpate the following structures:</p> <ul style="list-style-type: none"> • mandibular condyles • posterior border of the mandibular ramus • mandibular angle • inferior border of the mandible <p>Note: Be alert for asymmetry, palpable mobility, step deformities, depressions, and areas of tenderness. Mobility may be accompanied by a grating sound of fractured margins rubbing against one another. (This is called crepitus and is a positive finding in fractures.)</p>				
<i>Intraoral Examination</i>					
6	<p>Examine for malocclusion.</p> <p>Note: A malocclusion will be noted in the presence of displaced fractures involving the mandible and maxilla. Ask the patient, "Do your teeth come together properly?" A negative response suggests a displaced fracture.</p>				
7	<p>Use bimanual palpation on the mandible as follows ;</p>				
	<table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">Substep</th> <th style="text-align: left;">Action</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">a</td> <td>Place thumbs of both hands extraorally at the inferior border of the</td> </tr> </tbody> </table>	Substep	Action	a	Place thumbs of both hands extraorally at the inferior border of the
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		mandible and index fingers intraorally on the occlusal or incisal surfaces.
	b	Attempt to move the mandible superio-inferiorly, and medio-laterally at each interproximal space. (Movement will confirm a fracture.)
8		Examine the maxilla in the same manner:
	Substep	Action
	a	Place thumbs of both hands on the palate and index fingers on labial or buccal surfaces.
	b	Attempt movement in four directions. Note: Movement will confirm a fracture
9		Examine the maxilla as follows:
	Substep	Action
	a	Grasp the entire maxillary dentition by placing an index finger on the palate and the thumb on the labial region of the incisors.
	b	Attempt movement superio-inferiorly and laterally.
	c	Look at the bridge of the nose and try to determine if the maxilla moves independently of the superior structures. Note: If movement is detected, this is strongly suggestive of a midface fracture (Le Fort I, II, or III).
10		Examine the mandible as follows:
	Substep	Action
	a	Ask the patient to open and close his mouth.
	b	Look for deviation of the mandible to the right or left. Note: If a subcondylar fracture is present, the patient is likely to deviate toward the fractured side on opening and have premature posterior occlusal contact on the same side when closing. An anterior open bite accompanies these findings.
11		To further confirm a subcondylar fracture:
	Substep	Action
	a	Place the little fingers in each external auditory meatus and palpate the condylar head.
	b	Ask the patient to open and close his mouth. Note: A fracture is likely if a condyle fails to move in conjunction with the remainder of the mandible.

12	<p>Examine the oral mucosa for lacerations or ecchymosis, especially in areas where a relatively thin layer of oral mucosa covers the bone.</p> <p>Note: Mucosal lacerations often accompany displaced fractures. Ecchymosis suggests a rupture or tearing of the periosteum, and suggests a fracture in the area. LeFort fractures and zygomaticomaxillary complex (ZMC) fractures often show ecchymosis in the buccal vestibule adjacent to the maxillary first and second molars.</p>
13	<p>Question the patient to determine if paresthesia or anesthesia is present.</p> <p>Note: Anesthesia of the inferior alveolar nerve distribution suggests a displaced fracture in the body of the mandible. Anesthesia of the infraorbital nerve suggests either a possible Le Fort or ZMC fracture.</p>

Radiographic Examination

Introduction

Radiographs are obtained to confirm the presence of clinically suspected fractures and to rule out additional fractures not clinically evident. Most mandibular fractures occur in pairs--often one is clinically evident while the other is not.

Types of Radiograph Films

The following radiograph films are useful in diagnosing fractures of the mandible and midface. Each film gives specific information and has its limitations. These are discussed in detail on the following pages.

- panoramic
- mandible series
 - PA mandible
 - right and left lateral oblique
- AP Towne's Mandible
- Water's View
- submental vertex view
- dental periapical and occlusal films

Panoramic Film

The panoramic film is probably the most valuable film available for diagnosing fractures of the mandible. Fractures of the following areas can be detected:

- condylar region
- ramus
- angle
- body
- symphysis

Displacement in a superior or inferior direction can be readily assessed with this view, but lateral or medial displacement cannot be determined.

Caution: Some subcondylar fractures may be difficult to diagnose from this radiograph. Fractures of the ramus and angle require additional films to determine if displacement is present. A fracture of the angle can appear to be non-displaced on a panoramic view when, in fact, the ramus may be displaced considerably in a medial or lateral direction. Failure to diagnose such fractures can lead to very poor treatment results.

Mandible Series Films

The mandible series consists of three films--a PA mandible and right and left lateral obliques. When studying these radiographs, it is often helpful to have a dry skull available to aid in orientation and identification of landmarks.

Mandible Series--PA Mandible Film

The PA Mandible radiograph provides an excellent image of the entire mandible except for the condylar heads and the immediate subcondylar area. Fractures in the following areas can be detected:

- ramus
- angle
- body

- symphysis

Since the PA mandible film is exposed from a perspective of 90° from that of the panoramic or lateral oblique view, it provides valuable information regarding medial or lateral displacement of fragments.

Mandible Series--Left and Right Lateral Oblique Films

The left and right lateral oblique radiographs provide much of the same information as the panoramic view. Fractures in the following areas can be detected:

- condyle
- subcondylar region
- ramus
- angle
- body

These films do not provide good images of the symphysis region. If a good panoramic radiograph is available, the lateral obliques are not necessary. Often on weekends or evenings a panoramic view will not be available and the mandible series can be easily obtained and will provide adequate information for fracture diagnosis.

AP Towne's Mandible Film

The AP Towne's mandible is the best radiograph for assessing the mandibular condyles and subcondylar region. This view is taken in such a way that other bony structures are not superimposed over the condyles. If a condylar head or subcondylar fracture is suspected, obtain an AP Towne's mandible view.

Water's View Film

The Water's View must be obtained when fractures of the midface are suspected. This film is often difficult to interpret, and the use of a dry skull is recommended. You should look for asymmetry, fracture lines, or opacity of the maxillary sinuses. Fractures, if present, are likely to be noted at the lateral orbital rims, infraorbital rims, lateral wall of the maxillary sinus, and the zygomatic arches. All patients with midface fractures should be referred to the appropriate specialist.

Submental Vertex View Film (SMV)

The SMV is specifically indicated to confirm or rule out fractures of the zygomatic arch. If fractures are noted, the patient again needs to be referred. This view is often called the "jughandle."

Dental Periapical and Occlusal Films

Dental radiographs are often very helpful in diagnosing facial fractures. The sharp detail produced on these films can provide needed information regarding teeth in the line of fracture, fractured teeth, etc. An occlusal film can help determine the displacement of the inferior border of the mandible in the symphysis area. Do not overlook the value of these films.

Section C--Oral Surgical Techniques

Overview

Introduction

The oral surgeon must be familiar with many surgical procedures. This section discusses just a few of the more critical procedures for the IHS dentist.

Performing Radiographic Localization

Introduction

In many cases, radiographs will determine the surgical approach that will be used. Radiographs can provide you with the following information:

- shape of the tooth and curvature of the root(s)
- density of the surrounding bone
- thickness of the periodontal ligament and tooth follicle
- proximity of the tooth to the adjacent teeth and important structures
- position of the tooth in the alveolar process

Clark's Rule

SLOB = Same-Lingual; Opposite-Buccal

Two periapical radiographs are taken: one through the area where the impacted tooth is suspected to be, and one by moving the cone more distally. The radiographic film is placed in the same position for both exposures. Three possibilities will exist. The unerupted tooth--

- appears to move farther distally with a fixed landmark tooth.
- moves mesially as the cone moves distally, then the erupted tooth lies labial to the landmark tooth.
- remains stationary, then it lies at the same depth as the landmark tooth.

Occlusal Views

Maxillary Occlusals. Occlusal views are valuable if the central ray can pass through the long axis of the teeth. Because this is difficult to do in the maxilla, maxillary occlusals can be very deceiving.

Mandibular Occlusals. Mandibular occlusals, which have the central ray passing through the long axis of the teeth, can be very helpful in determining the position of impacted teeth in the bicuspid region.

Using the Aseptic Technique

Introduction

Oral surgical procedures provide an opportunity for the transmission of infection or disease from patient to patient, from surgeon or assistant to patient, or from the patient to members of the operating team. The preparation of the instruments and performance of the procedure should be done in such a way as to minimize transmission of disease.

Standardization

Standardization of instruments used in dental clinics throughout the IHS should be encouraged. This is especially helpful to dental officers and assistants who may be assigned from one clinic to another. It also helps when dental specialty consultants communicate with dental officers to offer suggestions and advice pertaining to oral surgery.

Instruments

Proper use of the following instruments will help you avoid the introduction of contaminants into the operating field which may result in disease transmission:

- carefully wrapped and autoclaved instrument packs containing all instruments and needed items
- sterile gloves
- sterile draping

Procedures for Setting Up for Oral Surgery

The following are procedures for setting up for an oral surgery procedure (impaction). The principles outlined are important; however, the procedure will need to be adapted to each clinic.

Step	Action
1	Clean the unit for the procedure.
2	Place the radiographs on the view box.
3	<p>Wash hands!</p> <p>Note: Nonsterile gloves may be worn at this point, but remember that they are clean, not sterile.</p>
4	<p>Gather all items needed for the procedure. This includes:</p> <ul style="list-style-type: none"> • autoclaved, wrapped instrument pack • sterile saline • sterile container for saline • irrigation syringe • bard parker blades • suture material • handpiece pack <p>Warning: Do not open any of these items at this time.</p>
5	Place the above listed items at the unit.
6	Open the sterile basic pack carefully in such a way that neither the basin nor the inside of the towel wrap are touched with the nonsterile gloves.
7	Fill the sterile basin with the sterile saline, being careful not to touch either the basin or towel with the saline container.
8	<p>Add expendable items to the sterile area near the saline basin by carefully opening each package and letting each item drop onto the sterile towel.</p> <p>Warning: Do not touch the sterile area at this time with the nonsterile gloves. You must have sterile gloves on before any item can be handled on the sterile towel.</p>
9	<p>Open the sterile pack carefully--touching the outside surface and corners only.</p> <p>Warning: Do not touch the inside with either bare hands or nonsterile gloves.</p>
10	<p>Set up anesthetic syringe, needle, and anesthetic carpules on an adjacent nonsterile area.</p> <p>Note: The doctor will anesthetize the patient while wearing the non-sterile gloves. The assistant can complete the set-up after changing to sterile gloves.</p>
11	<p>(Doctor) Put on sterile gloves carefully.</p> <p>Warning: Do not touch any surface outside the sterile packs after gloving.</p>
12	Complete the opening of the sterile packs by arranging the instruments on the sterile towel.

13	Drape the patient with a sterile towel, connect and secure the suction tubing to the evacuator, and begin the procedure.
14	Do not touch any object or surface outside the sterile area. Warning: If you inadvertently touch a nonsterile object, you must reglove. Note: The patient's chest can be used as a transfer point since a sterile towel is present.
15	(Assistant) Irrigate using a hand syringe in one hand and suction in the other. Warning: Never use internal spray from a high speed hand piece or water from a standard water-air syringe.

Treating Alveolar Fractures

Introduction

Injuries to the teeth and alveolar process are common and should be considered emergency conditions, since a successful outcome is dependent upon prompt management. Lacerations and abrasions of the skin or mucosa are noted frequently. All missing teeth must be accounted for and ensure that they are not imbedded in soft tissue injuries. Segments of the alveolar process that have fractured are usually readily detected by visual examination and palpation. These segments often contain more than one tooth.

Initial Treatment

The initial treatment is to attempt to place the segment into its proper position and then stabilize it until osseous healing occurs. This may require no more than digital pressure and a local anesthetic.

Procedures for Treating an Alveolar Process with Splintering

Frequently splintering of the alveolar process occurs making repositioning very difficult. You must then perform the following steps:

Step	Action
1	Develop a buccal flap to gain access to the fracture. Note: The flap must not jeopardize the blood supply to the alveolar segment and usually can be made through the buccal vestibule.

2	Gently reposition the segment with a blunt instrument
3	Ensure that the lingual soft tissue is intact before incising the facial tissue.
4	Examine the bony fractures and place the bone and the roots of the teeth in their proper position. Note: Often the ends of the roots will be luxated from the bony sockets and will need to be replaced into the sockets.
5	Perform endodontic treatment after 1 to 2 weeks if obvious interruption of the apical blood supply has taken place. Warning: Root canal treatment should not be performed at this initial stage since the extra time and trauma involved may do more damage than good. Those teeth having wide open apical foramen may not require endodontic treatment and should be carefully observed for healing.
6	Carefully inspect the occlusion once the alveolar segment appears to be in its proper position. Note: Slight misalignment along the base of the alveolar fracture is acceptable if the occlusion is accurate.
7	Stabilize the segment for four to six weeks. Note: Various methods of stabilization can be used. (See Stabilization Methods on following pages.)

Stabilization Methods

The following methods may be used to stabilize the segment:

- An arch bar placed across the segment and extended a few teeth on either side of the fractures is probably the simplest method.
- An acid-etched arch wire is also simple and acceptable.
- A cold cure acrylic splint can be made either in situ or on casts made following the reduction of the fracture and alignment of the occlusion.

Reflecting Flaps

Introduction

To a surgeon, having good access to the surgical field often means reflecting a flap. A properly developed flap will afford you optimum access to the field. A flap will heal much better and faster than a torn, traumatized area of tissue.

Caution: Care and dexterity should be used in reflecting flaps, as it is extremely important that soft tissue not be traumatized.

Indications for Mucoperiosteal Flaps

Mucoperiosteal flaps are indicated in the following situations:

- when you need to gain adequate vision of the operative field
- when bone removal is necessary
- when you want to avoid soft tissue injury

Requirements for Mucoperiosteal Flaps

The following requirements should be met prior to reflecting a flap:

- The incision should be large enough to permit access.
Note: A 4 cm incision heals just as fast as a 1 cm incision.
- The base should be wider than the free margin.
- The incision should be for the full thickness (i.e., you should go down to the bone with the incision).
- The margins should not be over a bony defect.

Treating TMJ Disorders

Introduction

Pain or dysfunction of the temporomandibular joint can be a difficult disorder to manage. The most common causes are either

- derangements of the joint itself
- myofascial pain dysfunction syndrome

Treatment Options

The majority of these conditions are generally well managed with a variety of nonsurgical treatment modalities. Detailed management is beyond the scope of this manual; however, a

number of excellent surgical textbooks and recent literature provide detailed descriptions of management techniques.

Phases of TMJ Management Protocol

The table below describes some of the events that may occur during each phase of the TMJ Management Protocol Process.

Phase	Events
1	Patient contact
2	Medical and Dental Histories Clinical Examination Radiographs Study Models Counseling Consultations
3	Splints Medications Manipulation Injections Diet Exercises Arthroscopy (closed lock)
4	Orthosis
5	Equilibration Occlusal Reconstruction Orthodontia Orthognathic Surgery
6	Physiotherapy Psychotherapy Splint Adjustment
7	Detailed imaging studies
8	Response
9	Arthroscopy or arthrocentesis (1st) Arthrotomy
10	Physiotherapy Psychotherapy Occlusal Management

Treating Odontogenic Infections

Introduction

Pulpal and periapical infections account for the majority of oral odontogenic infections. Most of the infections of the pulp and periapical regions are of a mixed variety and include both aerobic and anaerobic bacteria. Many microbiologists now believe that in periapical infections, more than 50 percent of all organisms are anaerobic.

Symptoms

Periodontal infections usually occur after a period of chronic periodontitis. The gingival tissue may become red, swollen, and painful.

Diagnosing Odontogenic Infections

Pain upon percussion and soft tissue swelling adjacent to the involved tooth can often pinpoint the cause of the infection. Radiographic evidence of a periapical radiolucency indicates extension of infection into the bone.

Common Treatment Regimens

- The following treatment regimens are recommended for the specific conditions described:
- If without further extension of the infection, start endodontic treatment or extraction along with appropriate surgical drainage and antibiotic therapy.
- If bone destruction is extensive, extract the involved tooth.
- If at any time there is purulence, perform culture and sensitivity tests. Select the antibiotic therapy according to the results.
- If fluctuance occurs in the soft tissue, make an incision and begin drainage.
- If infections extensively involve the soft tissue areas of the face and neck region, you must decide whether to admit the patient for aggressive management.

Treatment of a Pericoronal Infection of a Partially Erupted Mandibular Third Molar

Warning: Pericoronal infection of the partially erupted mandibular third molar presents a potentially life threatening situation.

Because of the anatomic location of the mandibular third molar, an infection may result in rapid soft tissue extension of the infection. This infection may spread into most of the fascial planes and also posteriorly and inferiorly into the mediastinum.

If an erupted maxillary third molar is irritating the soft tissue overlying the partially erupted mandibular third molar, the maxillary molar should be removed.

Antibiotics

The following antibiotics are appropriate in treating odontogenic infections:

- penicillin (if not allergic to it). (This is still the first drug of choice for oral infections.)
- V-Cillin K (or Pen VK) 500 mg dispense tab #28 Sig 1 tab po QID

Antibiotics (Anaerobic Organisms)

The following antibiotics are appropriate in treating odontogenic infections when anaerobic organisms are suspected:

- V-Cillin K (or Pen VK) 500 mg dispense tab #28 Sig 1 tab po QID **and** Metronidazole 500 mg dispense tab #28 Sig 1 tab po QID
- the Metronidazole may be added to the penicillin **but should never be used alone**

Alternative Antibiotics (Penicillin Allergy)

Patients with an allergy to penicillin may require an alternative antibiotic:

- Clindamycin 300 mg dispense tab #28 Sig 1 tab po QID
- Keflex 500 mg dispense tab #28 Sig 1 tab po QID

Other Alternative Antibiotics

When failure occurs with the above mentioned antibiotics, or if a beta lactamase producing bacteria is suspected, the following is a logical alternative: Augmentin 500 mg dispense tab #21 Sig 1 tab po TID

Indications for Hospitalization

The following is a list of indications for hospitalizing a patient with a severe orofacial infection:

- **Signs of severity:**
 - fever
 - dehydration

- rapid progression of swelling
 - trismus
 - marked pain
 - elevation of tongue
 - swelling of soft palate
 - submandibular swelling (possibility of Ludwig's angina if bilateral)
- **Symptoms of severity:**
 - marked pain
 - malaise
 - chills
 - difficulty swallowing
 - difficulty breathing
- **Laboratory test:**
 - elevated temperature (over 101°F)
 - elevated white blood count (WBC) (over 11,000)
 - shift to the left on differential count (increase in immature leukocytes)
- **Medical problems:**
 - diabetes mellitus
 - patient taking steroids or other immunosuppressive drugs
 - prosthetic valves or other prosthesis
- **Hospitalization may provide the following services:**
 - intravenous antibiotic dosage not possible with oral medication
 - adequate hydration
 - relief of severe pain
 - extraoral surgical drainage under general anesthesia
 - monitoring of life-threatening symptoms

Serious Facial Infections

When a determination is made that a patient should be admitted for a serious facial infection, an oral and maxillofacial surgeon should be consulted. The oral and maxillofacial surgeon is very familiar with the proper management of such cases. Rapid and aggressive management of a serious infection may save someone's life.

Performing Biopsies

Introduction

You must have a good understanding of oral pathology before performing a biopsy of the oral cavity. There are over 700 pathological conditions of the oral cavity. Many of these lesions are benign and present no life threatening danger if left alone; however, malignant lesions in the oral cavity require early diagnosis and treatment to prevent an early death.

Responsibility

Simple oral biopsies of the oral cavity can be performed under local anesthesia in the dental office by a general dentist with some surgical training. The anatomic site and malignant characteristics of the lesion may determine whether or not a general dentist should attempt a biopsy.

Types of Lesions

The following types of lesions may be found in the oral cavity:

- benign soft tissue lesions
- malignant lesions
- bone lesions

Benign Soft Tissue Lesions

The following soft tissue lesions, if in non-critical anatomic areas, could be biopsied by the general dentist:

- fibroma
- papilloma
- mucocele
- gingival hyperplasia
- amalgam tattoo
- epulis fissuratum

Malignant Lesions

Ninety percent of all oral malignancies are squamous cell carcinomas. Since they are surface lesions involving the soft tissues of the oral cavity and the lips, they are readily visualized on oral exam. Any ulcerated lesions that do not heal after a two to four week duration must be biopsied. Any reddish or white lesion that exists for more than two to four weeks should be biopsied even though there is no fresh ulceration.

Early diagnosis will save lives. A patient with any squamous cell carcinoma--

- less than 1 cm in diameter and with no lymph node involvement may have a 90 percent 5-year survival rate if totally surgically removed
- larger than 4 cm in diameter may have only a 10 percent 5-year survival rate if completely surgically removed

Warning: If you suspect a patient has a squamous cell carcinoma, immediately refer the patient to an Oral and Maxillofacial Surgeon for evaluation and biopsy.

Bone Lesions

Most bone lesions, especially if a malignancy is suspected, should be referred to an oral and maxillofacial surgeon.

Anatomical Considerations

The following areas in the oral cavity may be difficult for the general practitioner because of probable injury to vital structures:

- soft palate
- lingual surface of tongue
- floor of mouth
- areas adjacent to major salivary gland ducts
- area adjacent to the mental foramen

Types of Biopsy Procedures

Biopsy procedures are divided into either:

- excisional technique
- incisional technique

Excisional Technique

Lesions that are less than 1 cm in diameter may be biopsied using the excisional technique. The biopsy is performed by--

- removing the entire lesion
- submitting it for histological examination

A band of normal tissue should be included with the lesion specimen in this biopsy technique.

Note: There should be enough normal tissue included with the specimen to indicate that the total lesion was removed.

Incisional Technique

The incisional biopsy is performed by--

- removing a representative section from the lesion
- submitting it for histological examination

The representative section must include, if possible, the junction with the surrounding normal tissue. Necrotic areas should be avoided since they are seldom diagnostic. Superficial sections should be avoided since they are seldom diagnostic and may only show mucosal reactions and inflammation rather than the regions of primary concern.

Pathology Report

Any biopsy submitted to a pathologist must be accompanied by appropriate paper work. The pathology department that you deal with will provide the proper forms. Generally, any pathology report must include the following information:

- an adequate history of the lesion
- a complete clinical description of the lesion including color, size, and location
- your preliminary diagnosis

Considerations for Submitting a Biopsy

When submitting a biopsy the following factors must be considered:

- Submit the specimen to the pathologist the same day it is received.
- When appropriate, submit x-rays, photographs, and in some cases, study models.
- Do not use coloring agents on incisional biopsies, because they may affect the various stains employed in preparing the histologic sections.

- Inject local anesthesia around the lesion since a direct injection may distort the specimen.
- Electrosurgery is not indicated since this procedure may cause a severe alteration in the margins of the specimen.
- Immediately place the specimen(s) in an adequate volume of formalin.
- Always warn the pathologist if a calcified body is enmeshed with a soft tissue lesion. The presence of a calcified body will damage a microtome or ruin the remaining specimen during the sectioning procedure.

Submission of Specimens

If your local facility does not have a pathology department available, send your specimens to the following Naval Hospital:

Naval Medical Center
Laboratory Department EDA 13
34800 Bob Wilson Drive Suite 305
San Diego, CA 92134-1305
(619) 532-9340

Performing SBE Prophylaxis

Introduction

The administration of antibiotics to endocarditis-prone patients is a universal standard of practice. The benefits of preventing subacute bacterial endocarditis (SBE) are readily apparent since the treatment of this disease requires prolonged hospitalization and supportive care, followed by a long recovery period for those who survive.

Indications for SBE Prophylaxis

Endocarditis prophylaxis is recommended for dental procedures known to induce gingival or mucosal bleeding (including professional cleaning).

Contraindications for SBE Prophylaxis

Endocarditis prophylaxis is not recommended for--

- dental procedures not likely to induce gingival bleeding such as simple adjustment on orthodontic appliances or fillings above the gum line
- injection of local intraoral anesthetic (except intraligamental injections)
- shedding of primary teeth

Recommended SBE Prophylaxis Regimen for Adult Patients at Risk

The recommended standard prophylactic regimen for dental, oral, or upper respiratory tract procedures in **adult** patients who are at risk are as follows:

- Amoxicillin 2 grams orally 1 hour before procedure.

For amoxicillin/penicillin allergic patients, **any** of the following:

- Clindamycin 600 mg orally 1 hour before procedure
- Keflex 2.0 g orally 1 hour before procedure.
- Azithromycin or clarithromycin 500 mg orally 1 hour before procedure.

Recommended SBE Prophylaxis Regimen for Pediatric Patients At Risk

The recommended standard prophylactic regimen for dental, oral, or upper respiratory tract procedures in **pediatric** patients who are at risk are amoxicillin 50 mg/kg orally 1 hour before procedure.

For amoxicillin/penicillin allergic pediatric patients, **any** of the following:

- Clindamycin 20 mg/kg orally 1 hour before procedure.
- Keflex 50 mg/kg orally 1 hour before procedure.
- Azithromycin or clarithromycin 15 mg/kg orally 1 hour before procedure.

Normal Laboratory Values

Introduction

The following is a list of normal laboratory values for comparison against during testing and treatment.

Hematology

The following hematology values are provided:

- **hematocrit:**
 - Males = 47 ± 2

- Females = 42 ± 2
- **hemoglobin:**
 - Males = $16 \text{ g/dl} \pm 2$
 - Females = $14 \text{ g/dl} \pm 2$
- **white blood count (WBC):** $7000/\text{ml} \pm 3000$
- **mean corpuscular volume (MCV):** 90 ± 7
- **mean corpuscular hemoglobin (MCH):** 29 ± 2
- **mean corpuscular hemoglobin concentration (MCHC):** 34 ± 2

Coagulation

The following coagulation values are provided:

- **Ivy bleeding time:** 5 mm wound--1 to 9 minutes
- **prothrombin time (PT):** 11 to 16 seconds (compared to normal control)
- **partial thromboplastin time (PTT):** activated, 32 to 46 seconds (compared with normal control)
- **platelets:** 140,000 to 440,000/ml
- **International Normalized Ratio (INR):** 1 to 1.5

Blood Chemistry

The following are blood chemistry values for oral surgery:

- $\text{HCO}_3 = 18$ to 21 mEq/L
- $\text{pCO}_2 = 80$ to 100 mmHg
- $\text{Ph} = 7.38$ to 7.44
- $\text{pO}_2 = 80$ to 100 mmhg
- Calcium: 9 to 11 mg/dl
- Carbon dioxide: 21 to 30 Meq/L
- Chloride: 98 to 106 Meq/L
- Cholesterol

- Total: 180 to 240 mg/dl
- Esters: 100 to 180 mg/dl
- Creatinine: 1 to 1.2 mg/dl
- Glucose: 75 to 105 mg (fasting)
- Osmolality: 280 to 300 mOsm/L
- Phosphatase
 - Acid: 0.2 to 1.8 international units
 - Alkaline: 21 to 91 international units
- Phosphorus: 3 to 4.5 mg/dl, 1-1.5 Meq/L
- Potassium: 3.5 to 5.0 Meq/L
- Protein: 5.5 to 8.0 g/dl,
- Sodium: 136 to 145 Meq/L
- Urea nitrogen: 10 to 20 mg/dl,

Instrument List and Sources

Introduction

The following are recommended surgical instruments and their sources. These instruments can be obtained from many vendors; however, a source is provided simply as a starting point. This does not recommend these sources over any others that are available.

Suppliers

The following surgical items can be obtained from the listed source:

Item	Catalog No.	Source
Surgical pack:		
Huck towels (5), sterile, 16" x 30"	542-310	Medline Industries One Medline Place Mundelein, IL 60060-4486 1-800-323-5886
Minnesota retractor	100-2102	
301 elevator	100-7934	
34s elevator	100-6436	
190 Woodward elevator	600-2134	
191 Woodward elevator	600-6802	
Curette, double ended, Miller #11	600-2571	
Hemostat, curved Kelly, 5 1/2"	100-8381	
Needle holder, 6 inch	100-2570	
Scissors, Dean	100-8553	
Rongeurs, Blumenthal	100-7453	
Bone file, Miller #21	600-1254	

Bard Parker handles #3 (2) Periosteal, Woodson #1 Cannula, Irrigation, 16 gauge Suction tip, Frazier, #12	003-0993 62-000-97 09-001-67 09-000-66	5 Harbor Park Drive Port Washington, NY 11050 1-800-851-0400
Tubing for suction	003-2952	Ace Surgical Supply Co P.O. Box 1710 Brockton, MA 02403 1-800-441-3100
Osteotome, hand pressure, Woodward 69W	E69W	Hu-Friedy 3232 North Rockwell Street Chicago, IL 60618 (312) 975-6100
Towel clamps (Gizmo)		Hemox, Inc. P.O. Box 362115 Melbourne, FL 32936 1-800-323-4393
Tubing adaptor		Quality Aspirators P.O. Box 382120 Duncanville, TX 1-800-858-2121
Cup, Stainless Steel, 14 oz		W. Lorenz Surgical Instruments 9850 Interstate Center Drive Jacksonville, FL 32218 1-800-874-7711
Bur, surgical, 703	384367	Midwest 901 W. Oakton Street Des Plaines, IL 60018 (312) 640-4956
Disposable Items:		
Needle 25 gauge long Bard Parker blade #12 Bard Parker blade #15 Suture 3-0 on X-1 needle Anesthetic	194-9460 100-0124 100-1259 654-9902	Henry Schein 5 Harbor Park Drive Port Washington, NY 11050 1-800-851-0400
Syringe, 20cc disposable, Luer-loc	325-170	Medline Industries One Medline Place Mundelein, IL 60060-4486 1-800-323-5886
Handpieces, Surgical:		

Air or nitrogen driven		
Hall		Zimmer
Impact air		Innovators, Inc.
KaVo		KaVo America
Micro-Aire 2910		Micro-Aire Surg.
Modified Midwest		Rio Dell Dental
Electric		
Hall		Zimmer
Stryker		Stryker Instruments
Osteopower 2I		OsteoMed

Section D--Complications of Exodontia

Overview

Introduction

Many potential complications can occur with tooth extraction. These complications are usually the result of--

- inadequate presurgical assessment of the patient
- poor access visualization
- poor surgical technique (most often the use of excessive force)
- incorrect use of instruments
- inadequate hemostasis limiting visibility

Common Complications

The following are common complications associated with oral surgery:

- fainting (syncope)
- root fractures
- opening into the sinus
- tuberosity fractures
- bleeding
- aspiration/swallowing of foreign objects
- nerve injury (inferior alveolar, mental, and lingual nerves)
- temporomandibular joint (TMJ) trauma
- postoperative pain

Management of Complications

Every dental provider **must** consider all potential complications that may arise in conjunction with oral surgical procedures. Not only does proper prevention or treatment of complications serve the patient's best interest, but in today's litigious society, prudent legal risk management dictates that the dentist pay close attention to accurate diagnosis, informed consent, prevention/treatment of complications, and referral to a specialist when appropriate.

Fainting

Introduction

Fainting is a common untoward reaction in dental patients. It occurs most frequently with needle insertion and is a reaction to the situation and not to the local anesthetic drug. It is precipitated by fear, anxiety, or pain.

Warning: This complication can be serious in the geriatric or arteriosclerotic patient.

Prevention

Syncope can usually be prevented by the doctor observing the patient and taking the following minor precautions:

- Local anesthetic should only be given with the patient in the supine position.
- At the completion of the procedure the patient should be raised to the sitting position slowly and observed for the following signs:
 - becoming pale
 - closing his eyes
 - lowering his head because he feels dizzy

If these signs occur the patient should be placed promptly in the recumbent position with the head lower than the rest of the body with elevation of his legs. A cold towel should be placed on the forehead.

Symptoms

If consciousness is lost, there may be brief, simultaneous muscle twitching or mild convulsions due to cerebral ischemia. It is important to distinguish between syncope and cardiac arrest. This can be done quickly by briefly assessing the pulse and respirations. Although the pulse in syncope may be characterized as weak and thready, it is nevertheless present, along with a blood pressure and respiratory excursions.

Reacting to Fainting

Consciousness should return quickly with the patient in the recumbent or Trendelenberg position. Patients who have syncopal episodes should be actively treated, watched, and not left unattended.

Root Fractures

Introduction

Root fractures are another common complication associated with oral surgery. Fractures may occur to the tooth roots, and it is imperative to prevent their displacement into adjacent anatomical areas.

Reacting to Root Fractures

When a portion of a root is fractured, the operator should stop and take a few moments to analyze the situation and plan an approach to the problem. The following situations should be reevaluated before proceeding:

- **Patient position** - should promote optimum visualization
- **Light** - should be adequate and positioned to give maximum visibility
- **Suction** - along with adequate irrigation is essential in keeping a clean field
- **Assistants** - should be positioned to retract the soft tissues effectively and suction without obstructing the surgeon's field of vision
- **Surgical access** - the field should be well suctioned and the flaps retracted if necessary for optimum visualization

The operator should then continue with the appropriate procedure(s) described on the following page. (Specific procedures are provided for the various types of fractures/displacements.)

Procedures for Recovering Mandibular Root Tips

After planning your approach continue with the following steps:

Step	Action
------	--------

1	Luxate the root segment superiorly by manipulating it with the appropriate elevators as follows:	
2	Create a path of withdrawal for the root (if none exists) as follows:	
	Substep	Action
	a	Remove bone on some portion of the root
	b	Make a purchase point on the root for the elevator. Note: This will allow you to place adequate controlled force on the root for its removal.
3	Remove the root (when mobile) either by--	
	<ul style="list-style-type: none"> • placing an endodontic file or broach in the canal • or as follows: 	
	Substep	Action
	a	Rotate a #4 round bur with the handpiece in the canal.
	b	Stop the handpiece so the bur engages the tooth.
c	Remove the bur from the handpiece.	
	d	Remove the bur with the root attached by grasping the shank of the bur with a hemostat. Warning: Excessive force in the posterior region can cause displacement of a root tip mesially through the thin lingual plate into the submandibular space or inferiorly into the inferior alveolar canal.

Root Displaced to the Lingual

When a root is displaced to the lingual, it often may be palpated with a finger and manipulated back through the lingual plate defect into the extraction site. This permits removal through the socket. If this is unsuccessful, a mucoperiosteal flap is elevated and the tip visualized and removed.

Root Displaced Into the Inferior Alveolar Canal

If a root tip is displaced into the inferior alveolar canal, it is almost impossible to remove bone through the socket to retrieve the root. There is usually excessive bleeding from the canal that makes visualization poor, and blindly probing the area will result in increased injury to the neurovascular bundle. These root tips may be left if there are no symptoms. If removal is necessary, it is best done in the operating room by an experienced surgeon.

Procedures for Recovering Maxillary Root Tips

The same principles of access discussed for recovery of mandibular root tips apply to recovering

maxillary root tips with the following exceptions:

- It is especially important that force applied with the elevator not push the root apically. If this happens, the root may be displaced into the maxillary sinus. If a large root or tooth is lost into the maxillary sinus, then it is imperative that it be removed.
- Occasionally a minimally displaced maxillary root may be removed using a small suction tip placed in the socket; however, enlargement of the opening should be avoided. It is preferable to use a Caldwell-Luc procedure which should only be done by one who has had experience in that area.
- Occasionally in the removal of a maxillary third molar a small root tip may be lost into the maxillary sinus. Usually, removing this tiny fragment is unnecessary and leaving it will not cause complications to the patient.

Sinus Openings

Introduction

Another complication of oral surgery is the accidental creation of an opening into the sinus. This may be the result of a root fracture or displacement of a maxillary third molar.

Prevention

To avoid this complication you should determine from preoperative radiographs if an opening into the sinus is likely (e.g., a solid molar resting against a thin walled large maxillary sinus). When there is a likelihood of such openings, controlled tooth division may be the treatment of choice.

Reacting to an Opening in the Sinus

If you do create an opening into the sinus, the most important step is to place the patient on a sinus regimen consisting of the following:

- **antibiotics:** amoxicillin is a good first choice
- **nasal spray:** Afrin or Neo-synephrine (short term only-prevent rebound effect)
- having patient avoid blowing nose and sneeze with mouth open for up to three weeks
- **nasal decongestants**

This helps keep the sinus free of congestion and possible secondary infections.

Note: If an infection can be avoided, the sinus opening will often close spontaneously. Also, if a secondary procedure is necessary to close the sinus, it is much more likely to be successful if an infection has been avoided.

The patient should be followed and examined weekly to see if closure has occurred (i.e., no reflux of fluids in the nose when drinking or drainage from the opening).

If closure has not occurred in 2 or 3 weeks, a secondary procedure is necessary.

Tuberosity Fractures

Introduction

Tuberosity fractures, another complication of oral surgery, are most commonly caused by excessive force during removal of maxillary second and third molars.

Prevention

When removing teeth the surgeon should keep the tooth and surrounding soft tissues visible at all times and should palpate these areas as pressure is applied. It is important to recognize the fracture immediately, while it is occurring, so that soft tissue and bone can be saved.

Reacting to a Tuberosity Fracture

You should attempt to section the tooth from the fracture segment. If the segment remains attached to periosteum, it should be retained and stabilized with sutures. If you can not separate the tooth from the bony segment, then the overlying soft tissue should be reflected from the bony segment. This is to ensure that the bone and the attached mucosa are not removed with the tooth leaving a large sinus opening that may be difficult to close.

Bleeding

Introduction

Bleeding, whether primary or secondary, is another complication that can be anticipated and planned for by the surgeon.

Definitions

Primary bleeding is bleeding associated with the operation. This type of bleeding should present no serious problem.

Secondary bleeding is bleeding that occurs hours or days following a surgical procedure.

Prevention

The best way to avoid complications is to--

- give good postoperative instructions
- control the bleeding before the patient is discharged

Reacting to Primary Bleeding

To control primary bleeding use the following:

- local anesthesia
- clamps
- sutures
- packing

Procedures for Reacting to Secondary Bleeding

To control secondary bleeding perform the following steps:

Step	Action
1	Clean the area removing any liver clots that may have formed.
2	Examine the patient and determine the source of bleeding. (Direct pressure with a gloved finger to pinpoint the location of the bleeder if it is in the soft tissue.) Note: You will need good lighting and suction.
3	Place a moist gauze sponge over the area with pressure for 15 minutes.
4	If still bleeding, reinject the area with a local anesthetic solution which contains a vasoconstrictor.
5	If still bleeding, apply one or more sutures as necessary.
6	If bleeding is from socket, pack the socket.
7	Request a bleeding workup if bleeding persists or if a coagulation defect is a possibility.

Aspiration/Swallowing of Foreign Objects

Introduction

Aspiration of foreign material, such as roots, teeth, restorations, sponges, cotton rolls, dentures, drains, etc., occurs and causes obstruction. Practitioners should be constantly aware that they are

operating adjacent to the airway and that aspiration and obstruction are constant hazards.

Prevention

To prevent aspiration or swallowing of a foreign object during oral surgical procedures, a properly placed pharyngeal screen is important. This can usually be done by unfolding a 4 inch by 4 inch gauze and placing it between the surgical area and the posterior pharyngeal area.

Locating Aspirated/ Swallowed Objects

If an object is lost in the posterior pharyngeal area, its location (whether it was aspirated or swallowed) must be determined radiographically. In each case, chest and flat plane abdominal radiographs should be ordered.

Reacting to Aspirated Objects

If the object is in the lung, the patient should be referred immediately to the appropriate medical personnel so it can be removed by bronchoscopy or an open thoracotomy to avoid the formation of lung abscess.

Reacting to Swallowed Objects

If the object is swallowed, it should be followed with radiographs to determine its complete passage.

Nerve Injury

Introduction

Injury to the inferior alveolar nerve and to the lingual nerve can and do occur with even the best clinicians. Before mandibular impaction surgery or surgery around the mental foramen is done, the possibility of injury to the nerves must be discussed with the patient.

Procedures for Reacting to Nerve Injury

Perform the following steps when reacting to a nerve injury:

Step	Action	
1	Examine the involved area as follows:	
	Substep	Action
	a	Perform a two-point discrimination using calipers.
b	Perform a directional discrimination using light brush strokes with a cotton tip applicator	

	c	Perform a sharp and dull point discrimination.
	d	If there is a disruption of the taste sensation, map out the disruption of tongue for future reference.
2	Chart the initial extent of the injury as follows:	
	Substep	Action
	a	Draw a picture of the involved area in the chart.
	b	Record or map out the test results on the picture.
3	If no improvement in 3 to 6 months, consider specialty consultation.	

Consultation

If you do not feel comfortable evaluating the injury, or if you do not see improvement in 3 to 6 months, refer the patient for specialty consultation.

TMJ Injury

Introduction

Many patients with TMJ problems state that their first episode of symptoms occurred following a dental extraction, typically of a mandibular tooth.

Prevention

Dentists should recognize this potential and take the following steps:

- Obtain a history of any significant TMJ dysfunction prior to any oral surgical procedure.
- Advise patients who have preexisting TMJ dysfunction that an oral surgical procedure may cause additional joint symptoms or damage.
- Minimize force placed on the joint and how wide and how long the mouth is opened. (See below.)

Techniques for Minimizing Force

Techniques for minimizing the amount of force placed on the TMJ include--

- use of a rubber bite block for any mandibular procedure
- use of the least amount of force possible for any mandibular extraction.

Note: It is often appropriate to surgically remove difficult mandibular teeth to minimize the amount of force required. This is particularly important in patients with

preexisting TMJ symptoms.

Postoperative Pain

Introduction

Pain, swelling, and stiffness are expected the first 48 to 72 hours following surgery and are in direct proportion to the severity and length of the procedure accomplished. After 72 hours you should start to see a decrease in these components; if they persist, it is usually a sign of an underlying problem. The patient should then be examined clinically and radiographically.

Causes of Continued Postoperative Pain

The following conditions are some of the common causes of persistent pain following tooth extraction:

- postoperative infection
- localized osteitis (dry socket)
- retention of root, bone, or foreign body
- alveolar plate fracture
- maxillary sinus problems
- adjacent teeth
- muscle spasms
- nondental origin

Treatment for each of these causes follows.

Postoperative Infection Treatment

Treat postoperative infections with appropriate antibiotics and drainage if indicated.

Localized Osteitis (Dry Socket) Symptoms

Localized Osteitis usually occurs 3 to 5 days following extraction of a mandibular tooth with the third molar site being the most common. The following symptoms exist:

- The patient will complain that analgesics do not help the pain and that the pain radiates to the ear.
- There is a characteristic foul odor.
- The patient also complains of a bad taste.

The process usually last 7-10 days or until granulation tissue covers the exposed bone.

Localized Osteitis (Dry Socket) Treatment

Treat for localized osteitis as follows:

Step	Action
1	Irrigate the socket thoroughly with saline.
2	Dress the socket with a dressing consisting of Iodoform gauze saturated with eugenol (or one of the commercially available mixtures). Note: This dressing will last 24 to 48 hours
3	Redress the socket as necessary. (You may need to redress it several times.) Note: The dressing should be removed and the patient reevaluated in ten minutes. If the pain does not return, the socket likely does not require redressing.

Treatment for Retention of Root, Bone, or Foreign Body

The extraction site should be examined clinically and radiographically for any extraneous fragments. They may appear within the socket or between the alveolar plate and the mucosa.

Alveolar Plate Fracture Treatment

The socket should be examined for evidence of alveolar plate fracture (i.e., palpate for mobility). Small fragments of bone may need to be removed, but larger ones with periosteal attachment can be left and supportive care given until symptoms resolve.

Treatment for Maxillary Sinus Problems

Persistent pain in maxillary posterior teeth after surgery may be the results of sinusitis. The sinus should be evaluated clinically and radiographically and treated with appropriate antibiotics and surgical intervention when necessary.

Treatment for Pain from Adjacent Teeth

The teeth adjacent to an extraction site should be examined to determine whether the pain is arising from another tooth or associated tissues.

Causes of Muscle Spasms

Postoperative pain may be caused by--

- prolonged mouth opening during the procedure
- aggravation of a chronic or subchronic TMJ problem or trismus from where the surgery was done
- local anesthetic injection

Treatment for Muscle Spasms

Treatment for muscle spasms should be directed toward--

- obtaining muscle relaxation
- reducing inflammation in the muscle

This is accomplished with--

- heat to the area
- ibuprofen or other nonsteroidal anti-inflammatory drugs that reduce pain and inflammation
- range of motion stretching exercises to regain maxilla/mandible function and reduce swelling within the muscle

Treating Pain from Non-Dental Origin

Facial pain may persist after an extraction and have no obvious dental source. If you have done a thorough dental examine and ruled out dental factors, consider a facial neuralgia.