Introduction

Endodontics is a dental specialty recognized by the American Dental Association for the last 40 years. The American Association of Endodontists represents the specialty of endodontics and sponsors the American Board of Endodontics, the national certifying board for endodontists.

Endodontics is the branch of dentistry which is concerned with the morphology, physiology and pathology of the human dental pulp and periradicular tissues. Its study and practice encompass the basic clinical sciences including biology of the normal pulp, the etiology, diagnosis, prevention and treatment of diseases and injuries of the pulp and associated periradicular conditions.

The American Association of Endodontists is dedicated to excellence in the art and science of endodontics and to the highest standards of patient care. The Association inspires its members to pursue professional advancement and personal fulfillment through education, research, advocacy, leadership, communication and service. As part of this commitment to service, the AAE publishes the Guide to Clinical Endodontics.

The Guide reflects current practice considerations in endodontics that enhance the patient’s quality of care. Endodontists developed this guide for use by endodontists. Though insurance carriers, managed care organizations, attorneys in professional liability cases, legislators and regulators may use the Guide, the AAE did not develop the Guide specifically for use with reimbursement, litigations, legislation or regulations. These uses may be beyond the scope of these guidelines.

Practitioners cannot guarantee treatment outcomes. Variations in patients’ health, teeth, biological, physical and psychological factors will influence outcomes and may preclude success in any given situation. Endodontists using their best professional judgment may deviate from these guidelines for sound clinical reasons based on the circumstances of a particular patient but should include the reason for choosing the procedure performed in the patient’s record.

Endodontists should inform patients of all treatment options, including risks, benefits and alternatives to treatment, the option of no treatment and/or extraction. Patients should give their consent before any treatment is initiated. Practitioners should consult with their respective professional liability insurance carriers regarding specific recommendations relative to informed consent.

The scope of endodontics includes but is not limited to diagnosis and management of pulpal and periradicular pathosis through the following avenues:

- Nonsurgical endodontic treatment
- Surgical endodontic treatment
- Vital pulp therapy
- Management of traumatic injuries to the teeth and periradicular structures
- Restorative dental procedures related to enhancing the outcome of endodontic treatment
• Diagnosis and management of orofacial pain
• Repair of coronal or radicular defects caused by trauma, resorption or mechanical insults

Endodontic practice parameters are dynamic, requiring continual development and revision in response to advances in the basic and clinical sciences. The 2004 edition of the Guide to Clinical Endodontics represents the fourth major revision of this document since it was originally developed in 1987. The AAE made every effort to assure that the nomenclature and definitions used in the Guide correspond to those in the 2003 edition of the Glossary of Endodontic Terms and reporting codes in the American Dental Association’s Current Dental Terminology, Fourth Edition.

The accumulated clinical knowledge and judgment of the practitioner supported by published scientific research is the basis for endodontic treatment. The AAE provides a list of selected references for review, but the document is not a definitive bibliography of all current literature on the subject. The references are a sampling of the best available clinical and scientific evidence applying to each subject. By citing the listed reference material, the AAE does not necessarily imply endorsement of any statement contained in the reference material. Readers should consult other sources available to obtain a complete bibliography on the topic since the literature is constantly changing.

As the demand for endodontic treatment grows, the obligation for treating dentists to make increasingly complex clinical decisions will increase. It is incumbent on the dentist to undertake lifetime learning that results in understanding and accepting limitations in knowledge and clinical skills, and appropriately referring complex cases to specialists for treatment.

The American Association of Endodontists has the expertise and professional responsibility to assist endodontists along the path of continuing professional development. The AAE developed the Guide to Clinical Endodontics to serve this purpose.

—Ad Hoc Committee to Revise the Appropriateness of Care and Quality Assurance Guidelines

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A. Endodontic Examination and Diagnosis

Many features of evaluation in endodontics are common to all dental practice. These elements are herein abbreviated yet included for purposes of completeness. Diagnostic evaluation of pulpal and periradicular status must be performed for every tooth to be treated.

An adequate medical and dental history, the patient’s description of the chief complaint(s) and visual and radiographic examination provide basic information. Some indicated tests, such as thermal, electrical, percussion, palpation and mobility, should be accomplished. Additional periodontal examination, transillumination, observation of occlusal discrepancies and bacteriologic testing may be indicated. Reproducing the patient’s symptoms is desirable if not mandatory. In some situations, it may be advisable to make radiographs or digital radiographic images from more than one angle. It may also be necessary to make/take panoramic radiographs, bitewing radiographs, occlusal plane films and radiographs of the contralateral and opposing teeth. The use of enhanced magnification, illumination or intraoral photography may be an adjunct. A pulpal and periradicular diagnosis should be formulated for each tooth for which endodontic treatment is planned. The diagnostic categories used should be those specified in the AAE’s Glossary of Endodontic Terms for both pulpal and periradicular diagnoses.

It may be necessary to recommend follow-up visits for some patients at periodic intervals to compare specific data from the various examinations to facilitate an accurate pulpal and periradicular diagnosis. At times it may be necessary, when possible, to secure radiographs or digital radiographic images from previous practitioners to assist with the evaluation process.

Objectives:

a. To determine the need for treatment.

b. To determine those cases deemed to be too complex for the level of training, experience and expertise of the practitioner. (See the AAE Endodontic Case Difficulty Assessment Form and Guidelines in the Appendix.)

c. To determine if it is advisable to consult with or refer to other health professionals.

SELECTED REFERENCES:
Endodontic Examination and Diagnosis


B. Endodontic Treatment Planning, Records and Follow-up Visits

Endodontic treatment is based on an analysis of all diagnostic information. Treatment planning should include a determination of the strategic importance of the tooth or teeth considered for treatment, the prognosis and the urgency of treatment. It is incumbent upon providers of endodontic care to address endodontically related emergencies in a timely manner. Other factors, such as excessively curved canals, periodontal disease, occlusion, tooth fractures, calcified or occluded canals, restorability and teeth with complex root canal morphology, should be considered. (See the AAE Endodontic Case Difficulty Assessment Form and Guidelines in the Appendix.)

Treatment records should include the chief complaint(s) in the patient’s own words; a current medical and dental history; the results of diagnostic tests and clinical examination; clinical impressions based on subjective and objective evaluations; the pulpal and periradicular diagnoses and treatment recommendations; a description of treatment rendered, including pulpal status upon entry; the prognosis as reported to the patient; recommendations for tooth restoration; and the preoperative, appropriate working, postoperative and follow-up radiographs or digital radiographic images. Informed consent is required. It may be helpful to record patient commentaries before, during and after treatment. Prescriptions must be recorded, and consultations should be made part of the patient record.

Endodontic care includes evaluation of the patient’s postoperative response to the clinical procedures. Providers of endodontic services should encourage patients to return at appropriate follow-up intervals for evaluation.
SELECTED REFERENCES:
Endodontic Treatment Planning, Records and Follow-up Visits


Health Insurance Portability and Accountability Act of 1996.


C. Vital Pulp Therapy

1. INDIRECT PULP CAPPING

Indications for Treatment
Indirect pulp capping is indicated on permanent teeth with immature apices if all the following conditions exist:
- Tooth has a deep carious lesion that is considered likely to result in pulp exposure during excavation.
- No history of subjective pretreatment symptoms.
- Pretreatment radiographs should exclude periradicular pathosis.
- Patient has been fully informed that endodontic treatment may be indicated in the future.

Procedure
Treatment consists of two visits approximately six-to-eight months apart. At the first visit, caries biomass is excavated leaving affected dentin adjacent to the pulp. Calcium hydroxide or other biologically compatible material is placed over the dentin followed by a base, and the tooth is soundly restored. At the second visit, the restorative material and residual caries mass is removed, and the tooth is restored.

Objectives
- To prevent adverse clinical signs and symptoms.
- To obtain radiographic evidence of root development.
- To prevent breakdown of the periradicular supporting tissues.
- To prevent resorptive defects or accelerated canal calcification as determined by periodic radiographic evaluation.

2. DIRECT PULP CAPPING

Indications for Treatment
Direct pulp capping is indicated when all of the following clinical conditions exist:
- Mechanical exposure of a clinically vital and asymptomatic pulp occurs.
- Bleeding is controlled at the exposure site.
- Exposure permits the capping material to make direct contact with the vital pulp tissue.
- Exposure occurs when the tooth is under dental dam isolation.
- Adequate seal of the coronal restoration can be maintained.
- Patient has been fully informed that endodontic treatment may be indicated in the future.

Procedure
A radiopaque capping material is placed directly onto the surface of vital pulp tissue at the site of the pulp exposure followed by a base. The final restoration is placed over the base. The status of the pulp and periradicular tissues should be assessed through periodic recall examinations.

Objectives
- To prevent adverse clinical signs or symptoms.
- To develop contact of a radiopaque capping material with the pulpal tissue.
- To maintain normal responsiveness to electrical and thermal pulp tests.
- To prevent breakdown of the periradicular supporting tissue.

3. PULPOTOMY

Indications for Treatment
A pulpotomy may be indicated if any of the following clinical conditions exist:
- Exposed vital pulps or irreversible pulpitis of primary teeth. Primary teeth with insufficient root structure, internal resorption, furcal perforation or periradicular pathosis that may jeopardize the permanent successor are not indicated for pulpotomy procedures.
- As an emergency procedure in permanent teeth until root canal treatment can be accomplished.
- As an interim procedure for permanent teeth with immature root formation to allow continued root development (apexogenesis). (See Section D-3)

Procedure
Pulpotomy is the surgical removal of the coronal portion of vital pulp tissue. A biologically acceptable material is placed in the pulp chamber, and the tooth is restored.

Objectives
- To prevent adverse clinical signs or symptoms.
- To obtain radiographic evidence of sufficient root development for endodontic treatment. An increase in root length may be evident.
- To prevent breakdown of the periradicular supporting tissues.
- To prevent resorptive defects or accelerated canal calcification as determined by periodic radiographic evaluation.
SELECTED REFERENCES:
Vital Pulp Therapy


D. Nonsurgical Endodontics

1. PRIMARY TEETH

Indications for Treatment
Nonsurgical root canal treatment for primary teeth is indicated if any of the following clinical conditions exist:

a. Irreversible pulpitis or pulpal necrosis with no evidence of a permanent successor tooth.

b. Pulpal necrosis with or without evidence of periradicular disease.

c. Treatment will not jeopardize the permanent successor.

Procedure
Root canal treatment involves the use of biologically acceptable chemical and mechanical treatment of the root canal system to promote healing and repair of the periradicular tissues.

Debridement, enlargement, disinfection and obturation of all canals are accomplished using an aseptic technique with dental dam isolation. The appropriate biologically acceptable material is used to obturate the root canal(s).

• When a permanent successor tooth is evident, the debridement and shaping of the canal system are followed by obturation with an absorbable obturating material.

• When no permanent successor tooth is present, the canals of the primary tooth are obturated with a biologically acceptable nonabsorbable endodontic material. Root canal sealers are used in conjunction with the obturating material to establish an adequate seal.

Objectives

a. To alleviate present and prevent future adverse clinical signs or symptoms.

b. To create the radiographic appearance of a well-obturated root canal system where the root canal filling extends as close as possible to the apical constriction of each canal. Gross overextension, underfilling in the presence of patent canals, ledges and perforations should be avoided.

c. To prevent further breakdown of periradicular tissues.

d. To allow resorption of root structures and absorption of obturating material to occur when a permanent successor tooth emerges.

2. PERMANENT TEETH

Indications for Treatment
Nonsurgical root canal treatment for permanent teeth is indicated if any of the following clinical conditions exist:

a. Irreversible pulpitis.

b. Necrotic pulp with or without evidence of periradicular disease.

c. Teeth with a pulp that would be compromised during dental procedures, including but not limited to overdenture abutments, malformed teeth, post insertion and root resection.

d. Cracked or fractured teeth with pulpal involvement (with or without clinical symptoms) that can reasonably be expected to maintain satisfactory periodontal health.

e. Teeth with thermal hypersensitivity that significantly interferes with normal function, when alternative methods have failed to reduce the hypersensitivity.

Procedure
Root canal treatment for permanent teeth involves the use of biologically acceptable chemical and mechanical treatment of the root canal system to promote healing and repair of the periradicular tissues.

Proper access is dictated by the size and shape of the pulp chamber and its canal orifices, as well as by the tooth’s position in the arch. The entire roof of the pulp chamber is removed.

Cleaning, shaping, disinfection and obturation of all canals are accomplished using an aseptic technique with dental dam isolation. Root canal sealers are used in conjunction with a biologically acceptable semi-solid or solid obturating material to establish an adequate seal of the root canal system.

It is recognized that intracanal instruments will occasionally separate due to situations that are beyond the practitioner’s control. Recognizing this possibility, the practitioner must use sterilized intracanal instruments made of biocompatible materials, such as stainless steel and/or nickel-titanium. In the event that the fragment cannot be removed or bypassed without compromising tooth structure, the remainder of the accessible root canal space should be obturated with a biologically acceptable semi-solid or solid material. The patient should be informed of any incidence of instrument separation. This discussion should be noted in the patient record.

Paraformaldehyde-containing pastes or obturating materials have been shown to be unsafe. Root canal obturation with paraformaldehyde-containing materials is below the standard of care for endodontic treatment. The American Association of Endodontists and the American Dental Association do not recommend their use.
Following nonsurgical root canal treatment, the tooth must be restored as soon as possible in order to prevent coronal leakage into the root canal system and prevent fracture of the remaining tooth structure.

**Objectives**

a. To alleviate present and prevent future adverse clinical signs or symptoms.
b. To debride and shape the root canal system.
c. To create the radiographic appearance of a well-obturated root canal system where the root canal filling extends as close as possible to the apical constriction of each canal. Gross overextension, underfilling in the presence of patent canals, ledges and perforations should be avoided.
d. To maintain health and/or promote healing and repair of periapical tissues:
   i. If a tooth had a normal periodontal ligament space and an intact lamina dura surrounding the root(s) at the time of obturation, the subsequent postoperative radiographic appearance should remain unchanged after a suitable period of time for resolution of any transitory radiographic changes.
   ii. If the radiolucent area is decreasing in size or not enlarging and the tooth is asymptomatic, healing is considered to be incomplete, and additional follow-up visits with radiographic or digital radiographic images are indicated.
   iii. If a tooth had a preoperative periapical radiolucency, the follow-up radiographs or digital radiographic images should optimally demonstrate an intact lamina dura and a normal periodontal ligament space around the root(s) under observation.
   iv. There may be periapical bone healing without reformation of a normal periodontal ligament space.

### 3. **Apexification, Apexogenesis and Recalcification**

#### Indications for Treatment

Apexification, apexogenesis and recalcification procedures performed in conjunction with nonsurgical endodontics are indicated if any of the following clinical conditions exist:

a. Incomplete apical closure.
b. External root resorption or when the possibility of external root resorption exists.

#### Procedure

One method of apexification is to induce a calcified apical barrier in a root with an open apex or to encourage the continued apical development of an incompletely formed root in which the pulp is necrotic. Another method of apexification involves the placement of an artificial apical barrier prior to nonsurgical endodontic obturation. This method may be appropriate when patient compliance or long-term follow-up care is questionable.

Apexogenesis is vital pulp therapy performed to allow continued physiological development and formation of the root.

Recalcification procedures are methods for the treatment or prevention of external resorptive defects and internal resorptive defects perforating to the external tooth surface. The purpose of the procedure is to encourage biologic root repair.

These three procedures may involve several treatments (medication changes) over an extended period of time. Biologically acceptable materials should be used. When closure or repair is complete, nonsurgical root canal treatment should be completed.

**Objectives**

a. To alleviate present and prevent future adverse clinical signs or symptoms.
b. To induce radiographic evidence of apical closure or repair without breakdown of supporting tissues.
c. To provide biologic repair of the resorptive defect.

### 4. **Perforation Repair**

#### Indications for Treatment

Nonsurgical repair is indicated if any of the following clinical conditions exist:

a. A perforation of tooth structure has occurred during nonsurgical root canal treatment or post space preparation, and the perforation is within alveolar bone.
b. A communication between the pulp space and external root surface as a result of internal root resorption.

#### Procedure

The perforation defect is repaired using a biologically acceptable material to seal the communication between the pulp canal space and external root surface.

**Objectives**

a. To seal the root canal space from the external surface of the root.
b. Minimize extrusion of the repair material.
c. Promote healing of the periodontal structures at the site of the perforation.

### 5. **Nonsurgical Root Canal Retreatment**

#### Indications for Treatment

Nonsurgical root canal retreatment is indicated if any of the following clinical conditions exist:

a. Continued periapical pathosis.
b. Radiographic evidence of a deficiency in the quality of the root canal obturation when periapical pathosis or symptoms continue after endodontic treatment.
c. Persistent symptoms.
d. Anticipated restorative or prosthetic procedures that could compromise any pre-existing root canal obturations.

e. Anticipated restorative or prosthetic procedures on a tooth where the previous treatment quality is questionable.

f. Salivary contamination when bacterial leakage into the root canal system is suspected.

Procedure

Nonsurgical root canal retreatment is a procedure to remove the previously placed root canal obturating material and re-obturate the tooth. Cleaning, shaping, disinfection and obturation of all canals are accomplished using an aseptic technique with dental dam isolation. Root canal sealers are used in conjunction with a biologically acceptable semi-solid or solid obturating material to establish an adequate seal of the root canal system.

Additional procedures may be required to remove posts and manage canal obstructions, radicular defects, aberrant canal morphology, ledges or perforations. (See the AAE Guidelines for Assessing the Difficulty of Endodontic Cases in the Appendix.)

Retreatment cases may vary greatly in complexity, requiring greater effort, time and skill, and should be undertaken with due regard to the ability and experience of the practitioner. Retreatment may require augmentation by other treatment modalities, such as apexification, recalcification or surgical intervention to provide optimal treatment.

Objectives

a. To alleviate present and prevent future adverse clinical signs or symptoms.

b. To create the radiographic appearance of a well-obturated root canal system where the root canal filling extends as close as possible to the apical constriction of each canal. Gross overextension, underfilling in the presence of patent canals, ledges and perforations should be avoided.

To maintain health and/or promote healing and repair of periradicular tissues:

i. If a tooth had a normal periodontal ligament space and an intact lamina dura surrounding the root(s) at the time of obturation, the subsequent postoperative radiographic appearance should remain unchanged after a suitable period of time for resolution of any transitory radiographic changes.

ii. If the radiolucent area is decreasing in size or not enlarging and the tooth is asymptomatic, healing is considered to be incomplete, and additional follow-up visits with radiographic or digital radiographic images are indicated.

iii. If a tooth had a preoperative periradicular radiolucency, the follow-up radiographs or digital radiographic images should optimally demonstrate an intact lamina dura and a normal periodontal ligament space around the root(s) under observation.

iv. There may be periradicular bone healing without reformation of a normal periodontal ligament space.

SELECTED REFERENCES:

Nonsurgical Endodontics


Fish EW. Bone infection. J Am Dent Assoc 1939;26:691.

SELECTED REFERENCES: Nonsurgical Endodontics continued


**SELECTED REFERENCES:**  
**Nonsurgical Endodontics** continued


E. Surgical Endodontics

1. Incision and Drainage/Trephination

Indications for Treatment
Incision and drainage of soft tissues is indicated if any of the following clinical conditions exist:

a. If a pathway is needed in soft tissue with localized fluctuant swelling that can reasonably be expected to provide necessary drainage.
b. When pain is caused by accumulation of exudate within soft tissues.
c. When necessary to collect samples for bacteriologic analysis.

Trephination of hard tissues is indicated in any of the following clinical situations:

a. If a pathway is needed from hard tissue that can reasonably be expected to provide necessary drainage.
b. When pain is caused by accumulation of exudate within the alveolar bone.
c. When necessary to collect samples for bacteriologic analysis.

Procedure
Incision and drainage is a surgical opening created in soft tissue for the purpose of releasing exudate or decompressing the area of swelling.

Trephination is the surgical perforation of the alveolar cortical bone to release accumulated tissue exudate.

These procedures may include the placement and subsequent timely removal of a drain.

Antibiotics may be indicated if there is diffuse swelling (cellulitis), systemic symptoms or in patients who are immunocompromised.

Objectives
a. To alleviate present and prevent future adverse clinical signs or symptoms.
b. To reduce localized soft tissue swellings.
c. To promote acceptable repair of hard and soft tissues.
d. To prevent damage to teeth or anatomical structures.

2. Periradicular Curettage

Indications for Treatment
Periradicular curettage is indicated if any of the following clinical conditions exist:

a. Persistent periradicular pathosis following endodontic treatment.
b. A periradicular lesion that enlarges after endodontic treatment, as noted on follow-up radiographs or digital radiographic images.
c. When necessary for periradicular curettage, biopsy or to an additional root.
d. When the apical portion of the root canal system of a tooth with periradicular pathosis cannot be cleaned, shaped and obturated.

Procedure
Periradicular curettage is a surgical procedure to remove diseased or reactive tissue and/or foreign material from the alveolar bone in the apical or lateral region surrounding an endodontically treated tooth. By definition, the root is not resected.

A mucoperiosteal flap is surgically elevated and, when necessary, bone is removed to allow direct visualization of and access to the affected area. Thorough removal of all targeted tissue and/or foreign material is performed. Guided tissue regeneration techniques and/or bone replacement may be used if, at the time of surgery, the clinical condition warrants their use. Primary closure of the surgical site is desired.

Objectives
a. To alleviate present and prevent future adverse clinical signs or symptoms.
b. To promote repair of hard and soft tissues.
c. To minimize damage to adjacent teeth or anatomical structures.

3. Root-End Resection (Apicoectomy)

Indications for Treatment
A root-end resection (apicoectomy) in conjunction with periradicular curettage is indicated if any of the following clinical conditions exist:

a. Persistent periradicular pathosis following endodontic treatment.
b. A periradicular lesion that enlarges after endodontic treatment, as noted on follow-up radiographs or digital radiographic images.
c. A marked overextension of obturating materials interfering with healing.
d. Access for periradicular curettage, biopsy or to an additional root is necessary.
e. Access for root-end preparation and root-end filling is necessary.
f. When the apical portion of the root canal system of a tooth with periradicular pathosis cannot be cleaned, shaped and obturated.

Procedure
Root-end resection (apicoectomy) is the preparation of a flat surface by the excision of the apical portion of the root and any subsequent removal of attached soft tissues.

A mucoperiosteal flap is surgically elevated and, when necessary, bone is removed to allow direct visualization of and access to the affected area. Thorough removal of all targeted tissue and/or foreign material is performed. Guided tissue regeneration techniques and/or bone replacement may be used if, at the time of surgery, the clinical condition warrants their use. Primary closure of the surgical site is desired.
Objectives
a. To alleviate present and prevent future adverse clinical signs or symptoms.
b. To promote repair of hard and soft tissues.
c. To minimize damage to adjacent teeth or anatomical structures.
d. To preserve as much root length as possible.

4. **ROOT-END FILLING (RETROFILLING)/ROOT REPAIR**

**Indications for Treatment**
Root-end filling (retrofilling) and root repair, when anatomically feasible, are indicated if any of the following clinical conditions exist:
- Persistent periapical pathosis resulting from an inadequate apical seal that cannot be corrected nonsurgically.
- Periapical pathosis and a blockage of the root canal system that could not be obturated by nonsurgical root canal treatment.
- Root perforations.
- Resorptive defects.

**Procedure**
Root-end filling (retrofilling) is an additional procedure following root-end resection (apicoectomy). A biologically acceptable restorative material is placed into a root-end preparation. Root resorptive defects and perforations are repaired with a biologically acceptable filling material.

Following root-end resection, a preparation is made and a biologically acceptable repair material is placed. Guided tissue regeneration techniques and/or bone replacement may be used if, at the time of surgery, the clinical condition warrants their use. Primary closure of the surgical site is desired.

**Objectives**
a. To alleviate present and prevent future adverse clinical signs or symptoms.
b. To promote acceptable repair of hard and soft tissues.
c. To minimize damage to adjacent teeth or anatomical structures.
d. To preserve maximum root length possible.

5. **BIOLOGY**

**Indications for Treatment**
A biopsy is indicated if any of the following clinical conditions exist:
- When an adequate amount of tissue or foreign material can be removed from the periradicular surgical site for histopathologic examination.
- Persistent pathosis or pathosis inconsistent with endodontic disease is noted on clinical or radiographic examination.
- Medical history indicates the merits of biopsy.

**Objective**
To establish a diagnosis by histopathologic examination.

6. **HEMISECTION**

**Indications for Treatment**
Hemisection is indicated if any of the following clinical conditions exist:
- Class III or Class IV periodontal furcation defect.
- Infrabony defect of one root of a multi-rooted tooth that cannot be successfully treated periodontally.
- Coronal fracture extending into the furcation.
- Vertical root fracture confined to the root to be separated and removed.
- Cariosus, resorptive root or perforation defects that are inoperable or cannot be corrected without root removal.
- Persistent periapical pathosis where nonsurgical treatment or periradicular surgery is not possible and the problem is confined to one root.

**Procedure**
Hemisection is the surgical separation of a multi-rooted tooth through the furcation in such a way that a root and the associated portion of the crown may be removed. Occasionally, this procedure is performed on maxillary molars or premolars. Hemisection requires root canal treatment on all retained root segments. When possible, it is preferable to complete the root canal procedure and place a permanent restoration that extends into the canal orifices prior to the hemisection procedure.

**Objectives**
- To alleviate present and prevent future adverse clinical signs or symptoms.
- To eliminate or reduce significant periodontal defects.
- To perform acceptable root canal obturation(s) in the remaining root segment(s).
- To perform proper contouring of remaining tooth structure.
- To seal all external openings into the pulp chamber.
- To provide a portion(s) of the tooth that is/are restorable and that can be maintained by the patient.

7. **ROOT RESECTION (ROOT AMPUTATION)**

**Indications for Treatment**
A root resection procedure is indicated if any of the following clinical conditions exist:
- Class III or Class IV periodontal furcation defect.
- Infrabony defect of one root of a multi-rooted tooth that cannot be successfully treated periodontally.
c. An existing fixed prosthesis that will be seriously compromised by a hemisection.

d. Vertical root fracture confined to the root to be separated and removed.

e. Carious, resorptive root or perforation defects that are inoperable or cannot be corrected without root removal.

f. Persistent periradicular pathosis where nonsurgical root canal treatment or periradicular surgery is not possible.

g. At least one root is structurally sound.

Procedure

Root resection (root amputation) is the surgical removal of an entire root(s) leaving the crown of the tooth intact. Root resection requires root canal treatment on all retained root segments. When possible, it is preferable to complete the root canal procedure and place a permanent restoration that extends into the canal orifices prior to the root resection procedure.

Objectives

a. To alleviate present or prevent future adverse clinical signs or symptoms.

b. To eliminate or reduce significant periodontal defect(s).

c. To perform acceptable root canal obturation(s) in the remaining root segment(s).

d. To perform proper contouring of remaining tooth structure.

e. To seal all external openings into the pulp chamber.

f. To provide a portion(s) of the tooth that is/are restorable and that can be maintained by the patient.

g. To preserve an existing prosthesis where one root of an abutment requires removal.

8. INTENTIONAL REPLANTATION (EXTRACTION/REPLANTATION)

Indications for Treatment

Intentional replantation is indicated when all of the following clinical conditions exist:

a. Persistent periradicular pathosis following endodontic treatment.

b. Nonsurgical retreatment is not possible or has an unfavorable prognosis.

c. Periradicular surgery is not possible or involves a high degree of risk to adjacent anatomical structures.

d. The tooth presents a reasonable opportunity for removal without fracture.

e. The tooth has an acceptable periodontal status prior to the replantation procedure.

Procedure

Intentional replantation is the insertion of a tooth into its alveolus after the tooth has been extracted for the purpose of accomplishing a root-end filling or root repair. Stabilization of the replanted tooth may or may not be necessary. When possible, root canal treatment is performed prior to intentional replantation.

Objectives

a. To alleviate present and prevent future adverse clinical signs or symptoms.

b. To properly orient the tooth in the socket.

c. To eliminate periradicular pathosis.

d. To minimize periodontal pathosis.

e. To preserve the maximum root length possible.

f. To place root-end filling(s) or root repair material(s).

g. To maintain the tooth as a functional member of the dentition.

9. SURGICAL REMOVAL OF THE APICAL SEGMENT OF A FRACTURED ROOT

Indications for Treatment

When a root fracture occurs in the apical portion and pulpal necrosis results, the fractured segment may be removed surgically following or in conjunction with nonsurgical root canal treatment. Surgical removal of the apical segment of a fractured root is indicated when all of the following clinical conditions exist:

a. Root fracture in the apical portion of the root.

b. Pulpal necrosis in the apical segment as indicated by a periradicular lesion or clinical signs or symptoms.

c. Coronal tooth segment is restorable and functional.

Procedure

A mucoperiosteal flap is surgically elevated and, when necessary, bone is removed to allow direct visualization of and access to the affected site. The apical portion of the affected root and all of the targeted tissue are removed. A root-end resection and/or root-end filling may be necessary. Guided tissue regeneration techniques and/or bone replacement may be used if, at the time of surgery, the clinical condition warrants their use. Primary closure of the surgical site is desired.

Objectives

a. To alleviate present and prevent future adverse clinical signs or symptoms.

b. To remove the fractured root segment.

c. To promote acceptable repair of hard and soft tissues.

d. To maintain a favorable crown-to-root ratio.

e. To prevent damage to adjacent teeth or anatomical structures.

f. To maintain the tooth as a functional member of the dentition.
SELECTED REFERENCES:
Surgical Endodontics


**SELECTED REFERENCES:**

### Surgical Endodontics continued


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**F. Management of Traumatic Dental Injuries**

1. **Enamel Fracture (Uncomplicated Crown Fracture)**

   **Indications for Treatment**
   - Treatment of enamel fracture is indicated if *any* of the following clinical conditions exist:
     a. Enamel fracture.
     b. Chipped enamel not involving underlying dentin.

   **Procedure**
   - Enamel fractures usually require minimal treatment; chipped enamel can either be smoothed or repaired with bonded resin.

   **Objectives**
   - To alleviate present and prevent future adverse clinical signs or symptoms.
   - To establish an acceptable esthetic and functional tooth.

2. **Crown Fracture Without Pulp Exposure (Uncomplicated Crown Fracture)**

   **Indications for Treatment**
   - Treatment of crown fracture involving enamel and dentin, but without direct exposure of the pulp, is indicated when *both* of the following clinical conditions exist:
     a. The crown fracture involves enamel and dentin with no pulp exposure.
     b. The pulp tests reveal no indication for endodontic treatment.

   **Procedure**
   - In addition to restoring the esthetic aspect of the tooth, procedures for treating crown fractures without pulpal exposure are intended to protect the dentin and the underlying vital pulp. In immature teeth, continued root development may take place.

   **Objectives**
   - To alleviate present and prevent future adverse clinical signs or symptoms.
   - To establish an esthetic and functional tooth.
   - To determine radiographic evidence of continued/complete root development in immature teeth.

3. **Crown Fracture With Pulp Exposure (Complicated Crown Fracture)**

   **Indications for Treatment**
   - Treatment of crown fracture is indicated when *both* of the following clinical conditions exist:
     b. The pulp is vital.
Procedure
For immature teeth:
The purpose of treatment is to protect the pulp so that root development may continue to mature. Pulp capping or shallow pulpotomy procedures are indicated. A biologically acceptable material is placed directly in contact with the pulp to maintain the vitality and function of the remaining radicular portion of the pulp. A final restoration is placed. When the root reaches full maturation, nonsurgical root canal treatment and crown placement may be indicated.

For permanent (fully formed) teeth:
If a crown is not necessary for restoring the fractured tooth, it is acceptable to use pulp capping or shallow pulpotomy procedures followed by bonded composite resin or bonded fractured crown segment restorations, if carried out on teeth without clinical signs or symptoms of irreversible pulpitis and in a manner consistent with minimizing bacterial contamination. In any other case, nonsurgical root canal treatment is indicated. If the tooth requires a crown to restore function or esthetics, nonsurgical root canal treatment is an appropriate procedure prior to the crown placement.

Objectives
a. To alleviate present and prevent future adverse clinical signs or symptoms.
b. To place a radiopaque capping material in contact with the pulpal tissue.
c. To establish an acceptable esthetic and functional tooth.
d. To test pulps for vitality.
e. To maintain health and/or promote healing and repair of the periradicular supporting tissue.
f. To observe no resorptive defects or accelerated canal calcification as determined by periodic radiographic evaluation.
g. To promote sufficient root development for endodontic treatment. An increase in root length may be evident.

4. CROWN-ROOT FRACTURE

Indications for Treatment
Crown fracture involves enamel, dentin and cementum that may or may not involve the pulp.

Procedure
For immature teeth, the need for protecting the pulp is most important. Treatment, both immediate and definitive, is more complex and often requires innovative and unusual procedures.

Immature Teeth:
Immediate care. The purpose of treatment is to protect the pulp so that root development may continue. Pulp capping or shallow pulpotomy procedures are indicated. A biologically acceptable material is placed directly in contact with the pulp to maintain the vitality and function of the remaining radicular portion of the pulp. A final restoration is placed. When the root reaches full maturation, nonsurgical root canal treatment and crown placement may be indicated. In addition, soft tissue surgery to allow access to the fracture site may be necessary.

Definitive care. The same procedures as for crown fractures with pulp exposure are indicated.

Fully Formed Teeth:
Immediate and definitive care. Nonsurgical root canal treatment is indicated in most cases. Procedures to facilitate restorations may include, but are not limited to, surgical crown lengthening and root extrusion.

Objectives
a. To alleviate present and prevent future adverse clinical signs or symptoms.
b. To place a radiopaque capping material in contact with the pulpal tissue.
c. To establish an acceptable esthetic and functional tooth.
d. To maintain normal responsiveness to electrical and thermal pulp tests.
e. To maintain health and/or promote healing and repair of the periradicular supporting tissue.
f. To minimize resorptive defects or accelerated canal calcification as determined by periodic radiographic evaluation.
g. To promote sufficient root development for endodontic treatment. An increase in root length may be evident.

5. ROOT FRACTURE

Indications for Treatment
Root fracture involves cementum, dentin and pulp, and may be horizontal or oblique.

Procedure
In most cases, immediate care is directed toward reduction and stabilization of the fracture site.

Immediate care. Immediate care includes reduction and stabilization of the fracture site.

Definitive care. Definitive care is limited to periodic radiographic and clinical evaluations. If pulpal necrosis develops, root canal treatment is indicated.

If a root fracture occurs in the apical portion and pulpal necrosis results, the fractured segment may be removed surgically following/or in conjunction with nonsurgical root canal treatment. (See Section E-9)

If coronal tooth structure is lost apical to crestal bone, root extrusion or surgical crown lengthening may be indicated.
Objectives
a. To alleviate present and prevent future adverse clinical signs or symptoms.
b. To establish an acceptable esthetic and functional tooth.
c. To observe radiographic evidence of continued/complete root formation in immature teeth.
d. To observe radiographic evidence of root fracture repair (calcific, fibrous/fibrotic or bony).
e. To establish minimal tooth mobility.

6. LUXATION

Indications for Treatment
Luxation includes slight to severe injuries to teeth and their supporting structures.

a. Concussion — Trauma resulting in sensitivity to percussion but no excessive mobility and no displacement.
b. Subluxation — Injury to supporting tissues resulting in abnormal loosening of a tooth or teeth without displacement.
c. Extrusive luxation — Partial axial displacement of the tooth out of its socket.
d. Lateral luxation — Displacement of the tooth in a direction other than axially that can be accompanied by fracture of the alveolar socket.
e. Intrusive luxation — Axial displacement of the tooth into the alveolus and can be accompanied by fracture of the alveolar socket.

Procedure
Immediate care. Includes repositioning the tooth and nonrigid stabilization, when needed, to allow re-establishment of periodontal ligament support for the tooth.

Definitive care. Includes nonsurgical root canal treatment in teeth with pulpal necrosis or irreversible pulpitis as determined by appropriate diagnostic procedures.

The treatment for immature teeth varies from fully formed teeth in that efforts must be attempted to allow revascularization of the immature pulps, while fully formed teeth can receive nonsurgical root canal treatment as soon as pulpal necrosis or irreversible pulpitis has been established. In the case of intruded immature permanent teeth with open apices, immediate care can appropriately consist of monitoring on a regular basis for re-eruption.

Objectives
a. To alleviate present and prevent future adverse clinical signs or symptoms.
b. To create the radiographic appearance of a well-obturated root canal system where the root canal filling extends as close as possible to the apical constriction of each canal. Gross overextension, underfilling in the presence of patent canals, ledges and perforations should be avoided.

c. To maintain health and/or promote healing and repair of periradicular tissues:
   i. If a tooth had a normal periodontal ligament space and an intact lamina dura surrounding the root(s) at the time of obturation, the subsequent postoperative radiographic appearance should remain unchanged after a suitable period of time for resolution of any transitory radiographic changes.
   ii. If the radiolucent area is decreasing in size or not enlarging and the tooth is asymptomatic, healing is considered to be incomplete, and additional follow-up visits with radiographic or digital radiographic images are indicated.
   iii. If a tooth had a preoperative periradicular radiolucency, the follow-up radiographs or digital radiographic images should optimally demonstrate an intact lamina dura and a normal periodontal ligament space around the root(s) under observation.
   iv. There may be periradicular bone healing without reformation of a normal periodontal ligament space.

7. AVULSION (EXARTICULATION)

Indications for Treatment
Treatment is indicated when a tooth is completely separated from its alveolus.

Procedure
Immediate care is directed toward timely replantation of the avulsed tooth. The patient should be referred to his or her physician to evaluate the need for a tetanus booster if the avulsed tooth has come into contact with soil or if tetanus coverage is uncertain.

• The following pertains to teeth with less than one hour of extra-oral dry time or teeth transported in an acceptable transport medium.

Immediate care. Without compromising the root surface, rinse the tooth with sterile saline. Irrigate the tooth socket and gently replace the tooth into its normal position. Stabilize, if necessary, by splinting to adjacent teeth using a nonrigid splint; stabilize for the appropriate time to allow reattachment of periodontal ligament fibers. Systemic antibiotics are advisable.

Definitive care. For immature teeth with wide open apices, pulpal revascularization may occur and definitive care consists of monitoring on a regular basis for evidence of pulpal revascularization and continued root formation. For immature teeth in which revascularization does not take place, apexification procedures are followed by nonsurgical root canal treatment.
For mature teeth, timely nonsurgical root canal treatment that includes intracanal procedures to minimize resorption is indicated following replantation. Primary teeth are not suitable for replantation.

- **The following pertains to teeth with greater than one hour of extra-oral dry time.**

**Immediate care.** Remove debris and necrotic periodontal ligament from the root surface, immerse the tooth in a sodium fluoride solution, flush the socket with saline to remove coagulum and gently replace the tooth into its normal position. Stabilize, if necessary, by splinting to adjacent teeth using a nonrigid splint; stabilize for the appropriate time to allow reattachment of periodontal ligament fibers. Systemic antibiotics are advisable. The patient should be referred to his or her physician to evaluate the need for a tetanus booster if the avulsed tooth has come into contact with soil or if tetanus coverage is uncertain.

**Definitive care.** For mature teeth, timely nonsurgical root canal treatment that includes intracanal procedures to minimize resorption is indicated following replantation.

Permanent teeth with immature apices and an extra-oral dry time of greater than one hour are not suitable for replantation.

**Objectives**
- To establish revascularization in teeth with immature root development.
- To achieve re-attachment of periodontal ligament fibers and establish a normal periodontal ligament space.
- To re-establish a fully functioning tooth.
- To alleviate present and prevent future adverse clinical signs or symptoms.
- To create the radiographic appearance of a well-obturated root canal system where the root canal filling extends as close as possible to the apical constriction of each canal. Gross overextension, underfilling in the presence of patent canals, ledges and perforations should be avoided.
- To maintain health and/or promote healing and repair of periradicular tissues:
  - If a tooth had a normal periodontal ligament space and an intact lamina dura surrounding the root(s) at the time of obturation, the subsequent postoperative radiographic appearance should remain unchanged after a suitable period of time for resolution of any transitory radiographic changes.
  - If the radiolucent area is decreasing in size or not enlarging and the tooth is asymptomatic, healing is considered to be incomplete, and additional follow-up visits with radiographic or digital radiographic images are indicated.
  - If a tooth had a preoperative periradicular radiolucency, the follow-up radiographs or digital radiographic images should optimally demonstrate an intact lamina dura and a normal periodontal ligament space around the root(s) under observation. There may be periradicular bone healing without reformation of a normal periodontal ligament space.
  - Periradicular surgery may become indicated.

**8. Alveolar Fracture Involving Teeth**

**Indications for Treatment**
Treatment is indicated when there is an alveolar fracture that involves the socket of the tooth.

**Procedure**
- **Immediate care.** Requires reduction of the fractured alveolar segment and rigid splinting for an appropriate period of time.
- **Definitive care.** Involves the evaluation of the pulpal status of the associated teeth and completing nonsurgical root canal treatment when indicated.

**Objectives**
- To achieve satisfactory healing of the alveolar fracture.
- To provide nonsurgical root canal treatment when indicated.

(See the Recommended Guidelines of the American Association of Endodontists for the Treatment of Traumatic Dental Injuries for specific information.)
G. Intracoronal Bleaching

Indications for Treatment
An intracoronal bleaching procedure is indicated for a tooth that has both of the following clinical conditions:

a. The tooth is discolored from an internal source.

b. Acceptable root canal treatment has been performed if possible.

Procedure
The intracoronal bleaching procedure uses oxidizing agents within the coronal portion of an endodontically treated tooth to remove tooth discoloration. Dental dam isolation is essential. The degree of restoration to a normal color and return of the coronal translucency is dependent upon the cause, severity and duration of the discoloration.

To reduce the potential for resorption, a cement barrier must be placed to minimize penetration of the oxidizing agent into dentinal tubules in the cervical area. The use of heat in combination with 30% hydrogen peroxide should be avoided.

Objectives

a. To alleviate present and prevent future adverse clinical signs or symptoms.

b. To reduce or eliminate discoloration.

c. To improve the degree of translucency.

d. To minimize potential resorption.

SELECTED REFERENCES:
Management of Traumatic Dental Injuries


SELECTED REFERENCES: Intracoronal Bleaching


H. Restoration of Endodontically Treated Teeth

1. Post (Dowel)

Indications for Treatment
Post placement is indicated if both of the following clinical conditions exist:

a. The remaining coronal tooth structure is inadequate for the retention of a restoration.
b. When there is sufficient root length to accommodate the post while maintaining an adequate apical seal.

Procedure
Following nonsurgical root canal treatment, a post space is created in the root canal by careful removal of the coronal canal obturating material. A sufficient amount of material must be retained in the apical portion of the canal to maintain an adequate apical seal. A custom or proprietary post is fitted and cemented into the root canal for core retention. The post should be passively retained and is cemented and/or bonded into place so that no voids exist between the post and the surrounding tooth structure and root canal filling material. Preparation of the post space and placement of the post should be accomplished using an aseptic technique with dental dam isolation.

Objectives

a. To retain the core restoration.
b. To place the post along the long axis of the root.
c. To avoid perforations or root fractures.
d. To preserve the apical seal.
e. To eliminate any space between the post and the surrounding tooth structure or root canal filling material.
f. To place the post in root structure that is supported by bone.
g. To minimize contamination of the root canal system during the procedure.

2. Core

Indications for Treatment
Core restorations are indicated if any of the following clinical conditions exist:

a. The replacement of missing coronal tooth structure is necessary.
b. When the enhanced retention and resistance to displacement of the final restoration is necessary.

Procedure
The core material fills the pulp chamber and the coronal portions of the obturated root canal spaces, enhances the coronal seal and replaces missing coronal tooth structure in an endodontically treated tooth prior to the placement of the final restoration. The core may be constructed with a variety of acceptable materials and may or may not be used in conjunction with posts.

Objectives

a. To provide retention for the final restoration.
b. To occupy the entire pulp chamber with the core when possible.
c. The core does not perforate the pulp chamber floor.
d. To eliminate space between the core and the root canal filling material.

3. Posterior Teeth

It is recommended that endodontically treated posterior teeth be restored with a full cuspal protective restoration. The restoration should protect the remaining tooth structure and provide a coronal seal.

4. Anterior Teeth

Restoration of an endodontically treated anterior tooth is based on its clinical condition. Choice of the final restoration should be based on esthetic and functional requirements. The restoration should protect the remaining tooth structure and provide a coronal seal.
**SELECTED REFERENCES:**
Restoration of Endodontically Treated Teeth


SELECTED REFERENCES: Restored of Endodontically Treated Teeth continued


I. Post/Post and Core Removal

Indications for Treatment
The removal of a post, post and core, or core restoration is indicated if any of the following clinical conditions exist:

- Loss of adequate retention.
- Recurrent caries associated with the existing post, core or both.
- Fracture of the post, core or both.
- When access to the root canal system for nonsurgical retreatment is necessary.

Procedure
Posts and cores are removed in a variety of ways. These methods must be applied in a judicious manner to minimize the potential for damage to the root and the adjacent teeth and tissues.

Objectives

- To alleviate present and prevent future adverse clinical signs or symptoms.
- To remove the entire post.
- To avoid root fractures or perforations.
- To minimize damage to the tooth, adjacent teeth or tissues.

SELECTED REFERENCES:
Post/Post and Core Removal


SELECTED REFERENCES:
Post/Post and Core Removal continued


## GUIDELINES FOR USING THE AAE ENDOdontIC CASE DIFFICULTY ASSESSMENT FORM

The AAE designed the Endodontic Case Difficulty Assessment Form for use in endodontic curricula. The Assessment Form makes case selection more efficient, more consistent and easier to document. Dentists may also choose to use the Assessment Form to help with referral decision making and record keeping.

Conditions listed in this form should be considered potential risk factors that may complicate treatment and adversely affect the outcome. Levels of difficulty are sets of conditions that may not be controllable by the dentist. Risk factors can influence the ability to provide care at a consistently predictable level and impact the appropriate provision of care and quality assurance.

### PATIENT INFORMATION

Name:

Address:

City/State/Zip:

Phone:

### DISPOSITION

Treat in Office: Yes [ ] No [ ]

Refer Patient to:

Date:

---

### LEVELS OF DIFFICULTY

#### MINIMAL DIFFICULTY

Preoperative condition indicates routine complexity (uncomplicated). These types of cases would exhibit only those factors listed in the MINIMAL DIFFICULTY category. Achieving a predictable treatment outcome should be attainable by a competent practitioner with limited experience.

#### MODERATE DIFFICULTY

Preoperative condition is complicated, exhibiting one or more patient or treatment factors listed in the MODERATE DIFFICULTY category. Achieving a predictable treatment outcome will be challenging for a competent, experienced practitioner.

#### HIGH DIFFICULTY

Preoperative condition is exceptionally complicated, exhibiting several factors listed in the MODERATE DIFFICULTY category or at least one in the HIGH DIFFICULTY category. Achieving a predictable treatment outcome will be challenging for even the most experienced practitioner with an extensive history of favorable outcomes.

Review your assessment of each case to determine the level of difficulty. If the level of difficulty exceeds your experience and comfort, you might consider referral to an endodontist.

The AAE Endodontic Case Difficulty Assessment Form is designed to aid the practitioner in determining appropriate case disposition. The American Association of Endodontists neither expressly nor implicitly warrants any positive results associated with the use of this form. This form may be reproduced but may not be amended or altered in any way.

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### AAE Endodontic Case Difficulty Assessment Form

<table>
<thead>
<tr>
<th>CRITERIA AND SUBCRITERIA</th>
<th>MINIMAL DIFFICULTY</th>
<th>MODERATE DIFFICULTY</th>
<th>HIGH DIFFICULTY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. PATIENT CONSIDERATIONS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MEDICAL HISTORY</strong></td>
<td>No medical problem (ASA Class 1*)</td>
<td>One or more medical problems (ASA Class 2*)</td>
<td>Complex medical history/severe illness/disability (ASA Classes 3-5*)</td>
</tr>
<tr>
<td><strong>ANESTHESIA</strong></td>
<td>No history of anesthesia problems</td>
<td>Vasocostrictor intolerance</td>
<td>Difficulty achieving anesthesia</td>
</tr>
<tr>
<td><strong>PATIENT DISPOSITION</strong></td>
<td>Cooperative and compliant</td>
<td>Anxious but cooperative</td>
<td>Uncooperative</td>
</tr>
<tr>
<td><strong>ABILITY TO OPEN MOUTH</strong></td>
<td>No limitation</td>
<td>Slight limitation in opening</td>
<td>Significant limitation in opening</td>
</tr>
<tr>
<td><strong>GAG REFLEX</strong></td>
<td>None</td>
<td>Gags occasionally with radiographs/treatment</td>
<td>Extreme gag reflex which has compromised past dental care</td>
</tr>
<tr>
<td><strong>EMERGENCY CONDITION</strong></td>
<td>Minimum pain or swelling</td>
<td>Moderate pain or swelling</td>
<td>Severe pain or swelling</td>
</tr>
</tbody>
</table>

**B. DIAGNOSTIC AND TREATMENT CONSIDERATIONS**

<table>
<thead>
<tr>
<th>DIAGNOSIS</th>
<th>Signs and symptoms consistent with recognized pulpal and periapical conditions</th>
<th>Extensive differential diagnosis of usual signs and symptoms required</th>
<th>Confusing and complex signs and symptoms: difficult diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>RADIOGRAPHIC DIFFICULTIES</td>
<td>Minimal difficulty obtaining/interpreting radiographs</td>
<td>Moderate difficulty obtaining/interpreting radiographs (e.g., high floor of mouth, narrow or low palatal vault, presence of tori)</td>
<td>Extreme difficulty obtaining/interpreting radiographs (e.g., superimposed anatomical structures)</td>
</tr>
<tr>
<td>POSITION IN THE ARCH</td>
<td>Anterior/premolar</td>
<td>Slight inclination (&lt;10°)</td>
<td>Extreme inclination (&gt;30°)</td>
</tr>
<tr>
<td></td>
<td>Slight rotation (&lt;10°)</td>
<td>Moderate rotation (10-30°)</td>
<td>Extensive pretreatment modification required for rubber dam isolation</td>
</tr>
<tr>
<td>TOOTH ISOLATION</td>
<td>Routine rubber dam placement</td>
<td>Simple pretreatment modification required for rubber dam isolation</td>
<td>Extensive pretreatment modification required for rubber dam isolation</td>
</tr>
<tr>
<td>MORPHOLOGIC ABERRATIONS OF CROWN</td>
<td>Normal original crown morphology</td>
<td>Full coverage restoration</td>
<td>Restoration does not reflect original anatomy/alignment</td>
</tr>
<tr>
<td></td>
<td>Porcelain restoration</td>
<td>Moderate deviation from normal tooth/root form (e.g., taurodontism, microdens)</td>
<td>Significant deviation from normal tooth/root form (e.g., fusion, dens in dente)</td>
</tr>
<tr>
<td></td>
<td>Moderate deviation from normal tooth/root form</td>
<td>Teeth with extensive coronal destruction</td>
<td></td>
</tr>
</tbody>
</table>

**C. ADDITIONAL CONSIDERATIONS**

| TRAUMA HISTORY | Uncomplicated crown fracture of mature or immature teeth | Complicated crown fracture of mature teeth | Subluxation |
| ENDODONTIC TREATMENT HISTORY | No previous treatment | Previous access without complications | Previous access with complications (e.g., perforation, non-negotiated canal, ledge, separated instrument) |
| | Previous surgical or nonsurgical endodontic treatment completed |
| PERIODONTAL-ENDODONTIC CONDITION | None or mild periodontal disease | Concurrent moderate periodontal disease | Concurrent severe periodontal disease |

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*American Society of Anesthesiologists (ASA) Classification System:

- **Class 1**: No systemic illness. Patient healthy.
- **Class 2**: Patient with mild degree of systemic illness, but without functional restrictions, e.g., well-controlled hypertension.
- **Class 3**: Patient with severe degree of systemic illness which limits activities, but does not immobilize the patient.
- **Class 4**: Patient with severe systemic illness that immobilizes and is sometimes life threatening.
- **Class 5**: Patient will not survive more than 24 hours whether or not surgical intervention takes place.

www.asahq.org/clinical/physicalstatus.htm