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:

- Irreversible pulpitis or pulpal necrosis with no evidence of a permanent successor tooth.
- Pulpal necrosis with or without evidence of periradicular disease.
- 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 non-absorbable endodontic material. Root canal sealers are used in conjunction with the obturating material to establish an adequate seal.

Objectives
- 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 prevent further breakdown of periradicular tissues.
- 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:

- Irreversible pulpitis.
- Necrotic pulp with or without evidence of periradicular disease.
- Teeth with a pulp that would be compromised during dental procedures, including but not limited to overdenture abutments, malposed teeth, post insertion and root resection.
- Cracked or fractured teeth with pulpal involvement (with or without clinical symptoms) that can reasonably be expected to maintain satisfactory periodontal health.
- 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 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.

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 periradicular pathosis.
b. Radiographic evidence of a deficiency in the quality of the root canal obturation when periradicular 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:

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

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