CHAPTER 21
MANAGEMENT OF TRAUMA TO THE TEETH AND SUPPORTING TISSUES

III
TREATMENT OF VITAL PULP EXPOSURES (465-470)

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Tuesday 21\2\2017
1:00 pm-2:00 pm
LECTURE OBJECTIVES & OUTLINE

The immediate objective in treatment is to MAINTAIN THE VITALITY OF THE PULP

- Direct Pulp Cap
- Pulpotomy
- Pulpectomy with Endodontic Treatment
- Therapy to Stimulate Root Growth and Apical Repair Subsequent to Pulpal Necrosis in Anterior Permanent Teeth (Apexification)
DIRECT PULP CAP
Recent exposure: seen within an 1-2 hours after injury
Size: vital exposure is small
Retain capping material: sufficient crown remains to retain a temporary restoration to support capping material and prevent ingress of oral fluids.
Early reports of the use of both mineral trioxide aggregate (MTA) and bone morphogenetic proteins appear promising, not only for pulp capping but also for general use in endodontic therapy for vital and nonvital teeth. Calcium hydroxide Ca (OH)$_2$ remains the standard material.
PULPOTOMY

Indications of Shallow (partial) or conventional (cervical) pulpotomy:

- Immature permanent (open apex)
- A small pulp exposure exists and patient did not seek treatment until several hours or days,
- A small pulp exposure with insufficient crown remaining to hold a temporary restoration.
- Coronal pulp inflammation is not widespread
- A deeper access opening is not needed to help retain coronal restoration.
- Immature permanent teeth if necrotic pulp tissue is evident at exposure site with inflammation of underlying coronal tissue,
- Trauma to a mature permanent (closed apex) tooth that has caused both a pulp exposure and a root fracture.
PULPOTOMY
Exposure site should be conservatively ENLARGED, and 1 TO 2 MM OF CORONAL PULP TISSUE SHOULD BE REMOVED for shallow pulpotomy or all pulp tissue in pulp chamber removed for conventional pulpotomy.
Pulp chamber thoroughly CLEANED with copious irrigation. No visible dentin chips or pulp tissue tags should remain.
If remaining pulp is healthy, HEMORRHAGE will be easy to control with a pledget of moist cotton lightly compressed. Pulp have a BRIGHT REDDISH PINK color and a CONCAVE CONTOUR (meniscus).
A dressing of calcium hydroxide is gently applied in passive contact with pulp.
Remaining access opening is filled with a hard-setting, biocompatible material with excellent marginal sealing capability. Then crown be restored with a separate bonding procedure.

Pulpotomy – Immature Apex
If Vital = Apexogenesis
PULPECTOMY WITH ENDODONTIC TREATMENT
Wide an open or FUNNEL-SHAPED apex. Lumen of root canal of an immature tooth is largest at apex and smallest in cervical area and is referred to as a BLUNDERBUSS canal. Hermetic sealing of apex with conventional endodontic techniques is impossible without apical surgery. This surgical procedure is traumatic for young child and should be avoided if possible.
Calcium hydroxide is most commonly used root canal dressing for treatment of immature non-vital teeth. The purposes of Ca(OH)$_2$ are to:
• Achieve healing of periradicular tissues
• Arrest of inflammatory root resorption
• Formation of a hard tissue barrier apically
PULPECTOMY WITH ENDODONTIC TREATMENT

INDICATIONS:

• Acute periapical abscess.
• Very small pulp exposure that was overlooked,
• Pulp may have been devitalized as a result of injury or
• Actual severing of apical vessels.
• A loss of pulp vitality caused interrupted growth of root canal, with task of treating a canal with an open apex.

If an abscess is present, it must be treated first. If there is acute pain and evidence of swelling of soft tissues, DRAINAGE through pulp canal will give child immediate relief. A conventional endodontic access opening should be made. If pain is caused by pressure required to make opening into pulp, tooth should be supported by DENTIST'S FINGERS. ANTIBIOTIC therapy is also generally indicated.
APEXIFICATION:

• Immature root
• Necrotic permanent teeth and
• Should precede conventional root canal therapy.
• Calcific bridge develops just coronal to apex. When closure occurs, or when calcific "plug" is observed in apical portion, routine endodontic procedures completed; preventing possibility of recurrent periapical pathosis.
THERAPY TO STIMULATE ROOT GROWTH AND APICAL REPAIR SUBSEQUENT TO PULPAL NECROSIS IN ANTERIOR PERMANENT TEETH (APEXIFICATION)

The following steps are included in the technique:

1. Affected tooth is isolated with a RUBBER DAM, and an ACCESS OPENING is made into pulp chamber.
2. A file is placed in root canal, and a radiograph is made to ESTABLISH ROOT LENGTH. It is important to avoid placing instrument through apex, which might injure epithelial diaphragm.
3. After REMNANTS OF PULP ARE REMOVED using barbed broaches and files, canal is flooded with hydrogen peroxide to aid in removal of debris. Irrigated with sodium hypochlorite and saline.
4. The canal is DRIED with large paper points and loose cotton.
5. A thick paste of CALCIUM HYDROXIDE and camphorated mono-parachlorophenol (CMCP) or calcium hydroxide in a methylcellulose paste is transferred to canal with aid of an amalgam carrier. An endodontic plugger may be used to push material to apical end, but an excess of material should not be forced beyond apex.
6. A COTTON PLEDGET is placed over calcium hydroxide, and seal is completed with a layer of reinforced zinc oxide–eugenol cement.
THERAPY TO STIMULATE ROOT GROWTH AND APICAL REPAIR SUBSEQUENT TO PULPAL NECROSIS IN ANTERIOR PERMANENT TEETH (APEXIFICATION)

As a general rule treatment paste is allowed to remain 6 MONTHS. Root canal is then reopened to determine if tooth is ready for a conventional gutta-percha filling as determined by presence of a" positive stop" when apical area is probed with a file. Often there is also radiographic evidence of apical closure.

Frank has described four successful results of apexification treatment's:

- Continued closure of the canal and apex to a normal appearance,
- A dome-shaped apical closure with canal retaining a blunderbuss appearance,
- No apparent radiographic change but a positive stop in the apical area,
- A positive stop and radiographic evidence of a barrier coronal to anatomic apex.

If apical closure has not occurred in 6 months, root canal is retreated with calcium hydroxide paste. If weeping in canal was not controlled before filling, retreatment is recommended 2 OR 3 MONTHS after first treatment.
It should be recognized that teeth treated by apexification method are SUSCEPTIBLE TO FRACTURE because of the brittleness that results from nonvitality and from relatively thin dentinal walls of roots. In addition, another important problem with calcium hydroxide apexification technique is DURATION OF THERAPY, which often lasts many months.
NEW ENDODONTIC PROCEDURES USING MINERAL TRIOXIDE AGGREGATE (MTA) FOR TEETH WITH TRAUMATIC INJURIES

Preserve pulp vitality in developing teeth (pulpotomy).
Treat immature teeth with pulp necrosis (apexification).
Root fracture.

1990s Mahmoud Torabinejad and colleagues at Loma Linda uni. In California.
MTA has ph. 10.2-12.5 only
During setting time which is Useful for hard tissue induction.
Sets in about 3 hours, its comprehensive strength continue to increase over 3 wks. Consists of calcium silicate, calcium carbonate, calcium sulfate, calcium aluminate and bismuth oxide. Hydrophilic sets in presence of any moisture, including blood. Mixed with water or saline (3:1).

Biocompatibility. Non-mutagenicity. Encourages hard tissue deposition (stimulates interleukin formation and provides substrate for osteoblasts). Resist bacterial microleakage due to adaptation to dentine (tight physical adaptation) penetrated into dentinal tubule.
MTA does not deteriorate over time, it is not necessary to re-enter to remove material. Pulp capping and partial pulpotomy, can be placed on pulp that may still be bleeding slightly. Apexification. Recommended apical plug is 4 mm followed by resin filling or GP.