Conservative dentistry

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Treatment of Deep Seated Caries

In a shallow or moderately deep cavity all carious dentin should be removed leaving a glossy hard dentin surface.

In deep lesions all carious dentin at the periphery of the cavity should be excavated to establish a clean hard junction with the restorative material.

Faced with a deep carious lesion, the operator has several options in order of severity they are as follows:

A- Vital Pulp Therapy for Teeth Diagnosed with a Normal Pulp or Reversible Pulpitis:

I-Protective Base:

A protective base is a material placed on the pulpal surface of a cavity preparation, covering exposed dentin tubules, to act, as a protective barrier between the restorative material or cement and the tooth's pulp. Placement of a protective base such as calcium hydroxide or glass ionomer cement is at the dentist's discretion.

Indications: In a tooth with a normal pulp, when dentin is exposed and all caries is removed during the preparation for a restoration, a protective radiopaque base may be placed between the permanent

restoration and the dentin to minimize pulp injury, promote pulp tissue healing, or minimize postoperative sensitivity.

Objectives: A protective is utilized to preserve the tooth vitality promote pulp tissue healing and tertiary dentin formation, and minimize microleakage. Adverse post-treatment signs or symptoms such as sensitivity, pain, or swelling should not occur.

II-Indirect Pulp Capping:

*It is a two or more appointment procedure.

*Preferred by many clinicians and more conservative and more likely to yield favorable results than direct Pulp Capping.

*Giving the tooth benefit if they leave some questionable carious dentin and seal it.

Procedure of Indirect Pulp Capping):

1. Field must be isolated with rubber dam isolation to minimize bacterial contamination of the treatment site.
2. All peripheral carious dentin is removed with large round bur or spoon excavator.
3. Area adjacent to the pulp is debrided off only the soft carious dentin.
4. CaOH2 and ZOE - type cement Placed. After 4 - 6 W (3 months) or more

- Cement removed.
- Internal surface of the cavity inspected for remineralization and hard dentin.

- Remove any residual soft dentin.
- Permanent restoration applied.

Indication of Indirect Pulp Capping.

1- When there is a radiographically evident deep carious lesion encroaching on the pulp.

2- Tooth has no history of spontaneous pain.

3- Tooth responds normally to vitality test.

III-Direct Pulp Capping:

- Carious dentin is completely excavated.
- The pulp will bleed when cut with excavator.
- After the bleeding has stopped calcium hydroxide is applied to the pulpal opening and securely attached to the internal walls of the lesion with cement or permanent restoration.
- After 3-4 months, completely remove the cement and inspect the exposure site for secondary dentin formation.
  - ✓ If pulp has manifested sufficiently vitality to build a secondary dentin ridge over the exposure site favorable prognosis.
  - ✓ If not, pulp is condemned endodontic therapy.

Procedure Direct Pulp Capping:

1- Field must be isolated with rubber darn isolation to minimize bacterial contamination of the treatment site.

2- Enamel is cut away to have access.

3- By large excavator (sharp) soft carious dentin is carefully shaved.

4- Extreme care not to force carious dentin into pulp chamber (no

bur or dull excavator) is used.

5- Cleansing agent use sterile water or saline solution.

6- No air is used.

Size and character of the hemorrhage following an exposure provide a valuable diagnostic aid for prognosis

To avoid endodontic treatment:

a. The exposure should be very small.
b. The bleeding should be a bright red.

7- If bleeding at the exposure site is arrested and area is dry calcium hydroxide is a capping material of choice. [Extend 1-2mm peripheral to the exposure].

8- If bleeding is stubborn calcium hydroxide powder is peferred.

9- After cleansing the area, as much blood and debris. Cavity is dried then cotton pellets and calcium hydroxide is placed using wet cotton pellet. Bleeding is arrested. Excavator is used to scrape excess CaOH2 from periphery.

10- Sealing the $Ca(OH)_2$ with Zn.O.E. cement. Seal over the pulp obtained by Zn.O.E. cement or cement and amalgam. (Glass ionomer liner place over $Ca(OH)_2$ to improve strength during amalgam condensation and to enhance seal).

Clinical Successful for Direct Pulp Capping

1- No signs or symptoms of degeneration in pulp and there is sufficient evidence of reasonable reparative capacity.
2- No observable hemorrhage or blood coagulates.

3- Dentin at the periphery is repairable and verified by visual and tactile tests.
4- The exposure site is not constricted in the pulp chamber.
5- The field of the operation is completing aseptic.

Indication Direct Pulp Capping

1- Small mechanical exposure occurs.

2- Tooth must be isolated using rubber dam.

3- Adequate hemostasis must be achieved.

4- An Exposure should be covered with $Ca(OH)_2$ (provide high percentage of success).

5- Possible to restore the tooth with a well-sealed restoration (to prevent bacterial contamination).

Pulp Capping Agents

- *$Ca(OH)_2$* still widely used and taught
- Mineral trioxide aggregate (MTA)

IV-Permanent Tooth Pulpotomy:

*Pulpotomy: is a conservative therapy performed to remove the inflamed coronal portion of the pulp and preserve the vitality of the remaining radicular pulp.

*** Objectives: induce root closure.** ***Indications:***

1- Permanent tooth.

2- Incomplete root formation.

3- Pain history no extremes.

4- Clinically: no abscess/fistula, no extreme mobility, large carious lesion, or mechanical/traumatic exposure.

5- Radiographic: probable exposure, normal bony structures, incomplete development, and no internal or external root resorption.

Treatment Procedure:

1- Field must be isolated with rubber dam isolation to minimize bacterial contamination of the treatment site.

2- Amputate the pulp and surrounding dentin to a depth of 2mm beyond the exposure, cutting intermittently and with light pressure.

3- Establish hemostasis, cover pulp with calcium hydroxide and restore the tooth.

Criteria for successes:

1- No clinical signs or symptoms.

2- No radiographic pathology.

3- Continued development of immature roots.

4- Formation of calcific barriers.

5- Sensitivity to electrical stimulation.

Agents for Permanent Tooth Putpotomy

- $Ca(OH)_2$ most widely used
- Formocresol - limited circumstances - short-term preservation of permanent molar
- Glutaraldehyde - not well tested in permanent teeth

B- Nonvital Pulp Treatment:

- Pulpectomy (Conventional Root Canal Treatment).
- Extraction of the tooth.

Pulp Exposure:

Pulp exposure may occur during:

1- The preparation of deep cavities (mechanical or traumatic exposure) or,

2- Be the consequence of carious decay (pathological exposure).

The Healing Process in the Pulp after Injury:

For decades the only biological option has been to heal the pulp by forming a reparative dentinal bridge using calcium hydroxide. Once the exposed pulp capped with calcium hydroxide, the healing process in the pulp begins. Calcium hydroxide has a high PH value ranging from (10-12) and therefore its necrotic effect is limited on the superficial part of the pulp which contacts the material. Also its effect is short duration especially if the material of a quick setting nature as dycal. The repair process begin in the pulp at the 3rd day after capping by proliferation of fibroblast cells towards the side of injury from the deeper pulpal tissue.

Histologically at 3rd day we can see barrier across the exposure consisting of superficial necrotic zone beneath the dycal and deeper to this a layer of collagenous material (matrix) is formed and the pulp is free from inflammatory cells.

At l0th day, a bridge barrier is well recognized consisting of superficial layer of necrotic tissue and a deeper layer of homogenous matrix which is not yet calcified. There are blood vessels and cellular elements seem to have been entrapped within matrix because of rapidity of formation of the matrix by the proliferating cells. Beneath the barrier, there are an abundant number of cells proliferations towards the site of the exposure. The pulp is free from inflammatory cells.

At 30^{th} to 60^{th} days, a calcify bridge barrier is observed consisting of small superficial calcified necrotic layer adjacent to the dycal material and a thicker layer of less calcified homogenous matrix consisting necrotic cells and blood vessels and irregular tubules are observed. A pre-dentine layer is noticed lined by a single layer of flattened cells. The rest of the pulp is normal and free from inflammatory cells.

At one year post capping, a well calcified bridge barrier is observed consisting of a very thin layer of calcified necrotic tissue and a large layer forming the main bulk consisting tubules which are regular but less in number than the primary dentine. This layer is calcified and beneath there is pre-dentine lined by single layer of ovoid-shaped cells which are continuous with the odentoblast layer at both margins of the exposure. The pulp is free from the inflammatory cells but blood vessels appear dilated in some places of the pulp.