

Management of the Vital Pulp and of Immature Teeth

Dr. Sara Saedi

Assistant Prof.,

Dept. of Endodontics, School of Dentistry

Guilan University of Medical Sciences



Dentinogenesis

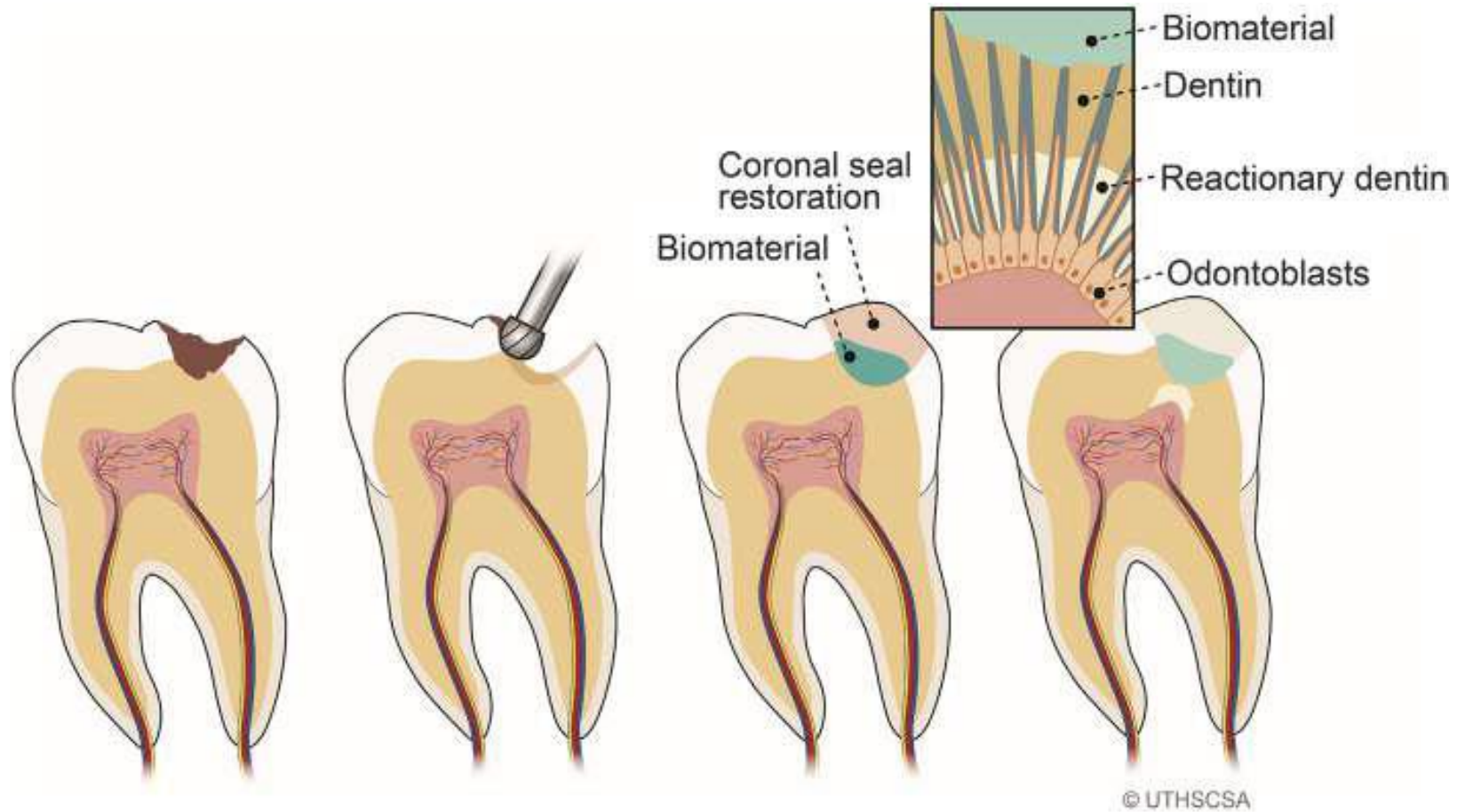
- Occurs prenatally for most teeth and continues as long as the pulp stays vital
- ✓ **Primary Dentin:** Formed during tooth development
- ✓ **Secondary Dentin:**
 - After tooth maturation
 - Slower rate
 - Resulting in the gradual deposition of dentin throughout the entire extent of the pulp canal spaces and pulp chamber

Normal Physiologic
Conditions

✓ **Tertiary Dentin:** In response to injuries to dentin-pulp complex

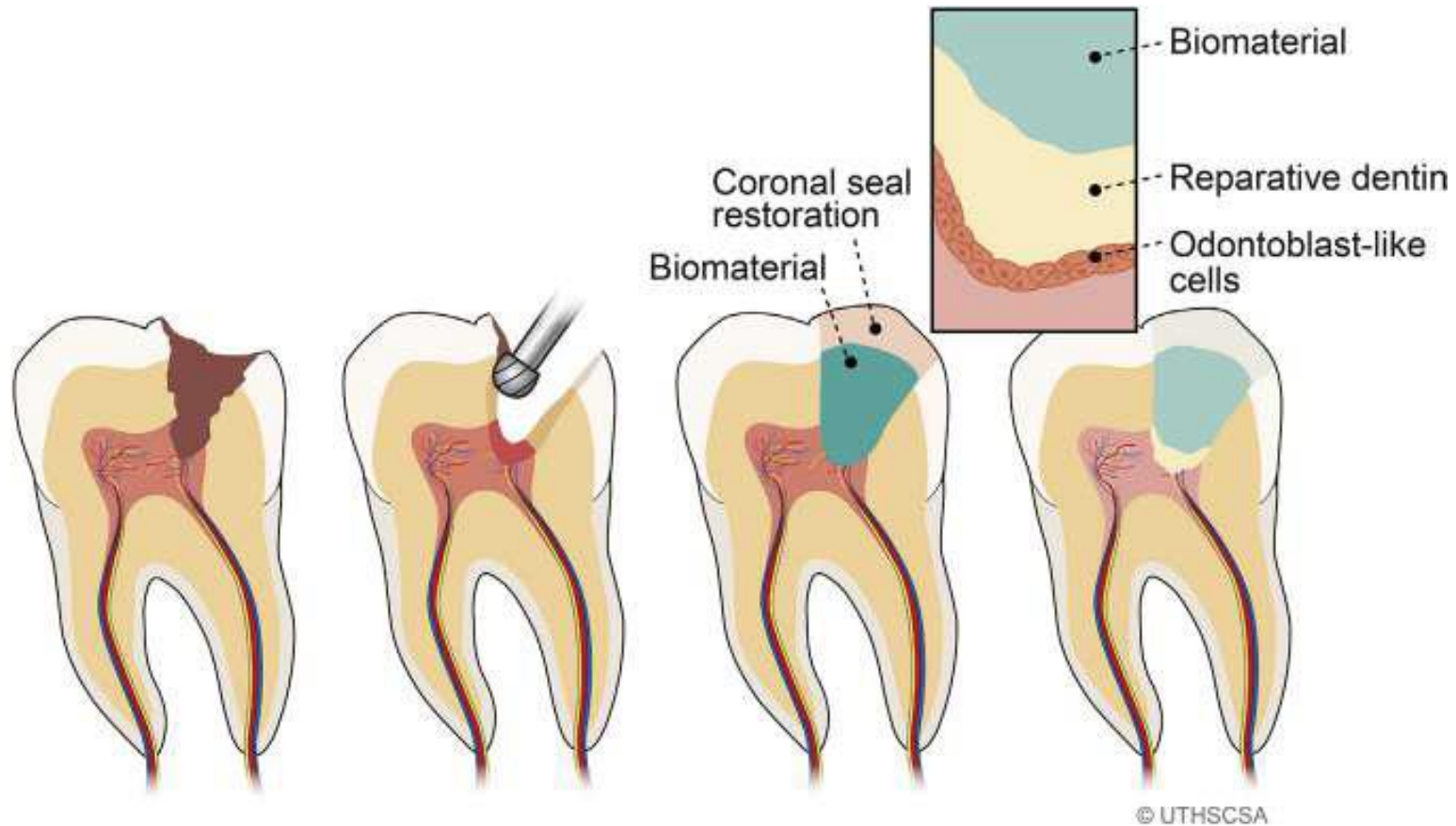
- Mild Injury → Stimulation of Odontoblasts → **Reactionary Dentin Formation**
- Intense Injury → Death of odontoblasts, Progenitor Cells recruited to the area → Differentiation to Odontoblast-like Cells → **Reparative Dentin Formation**

Localized increased thickness of the dentinal layer
Maintains the overall architecture of the dentin odontoblast interphase



Typically atubular

Due to its rapid secretion, often traps the mineralizing cells within its matrix resembling osteocytes; it is often referred to as “**osteodentin**.”

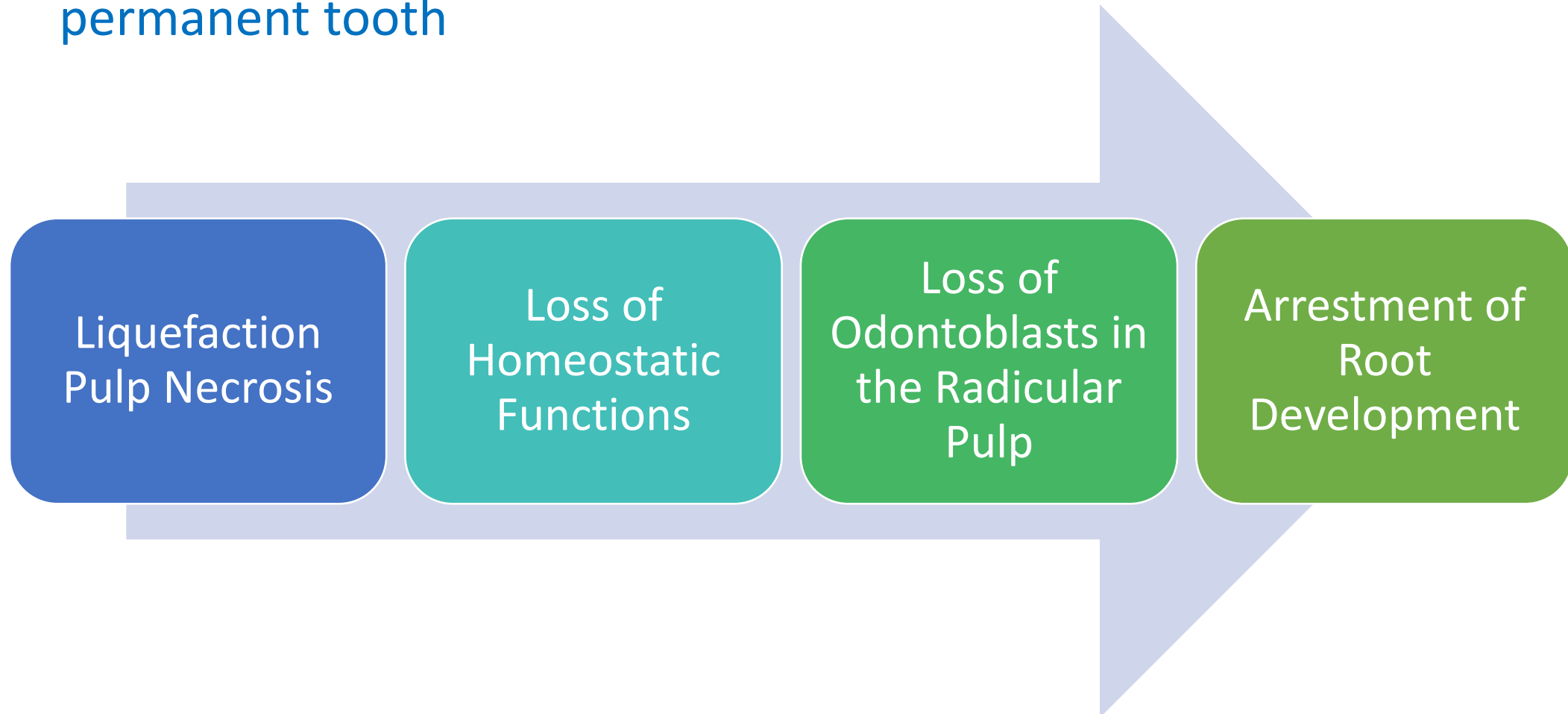


Transitional Approaches

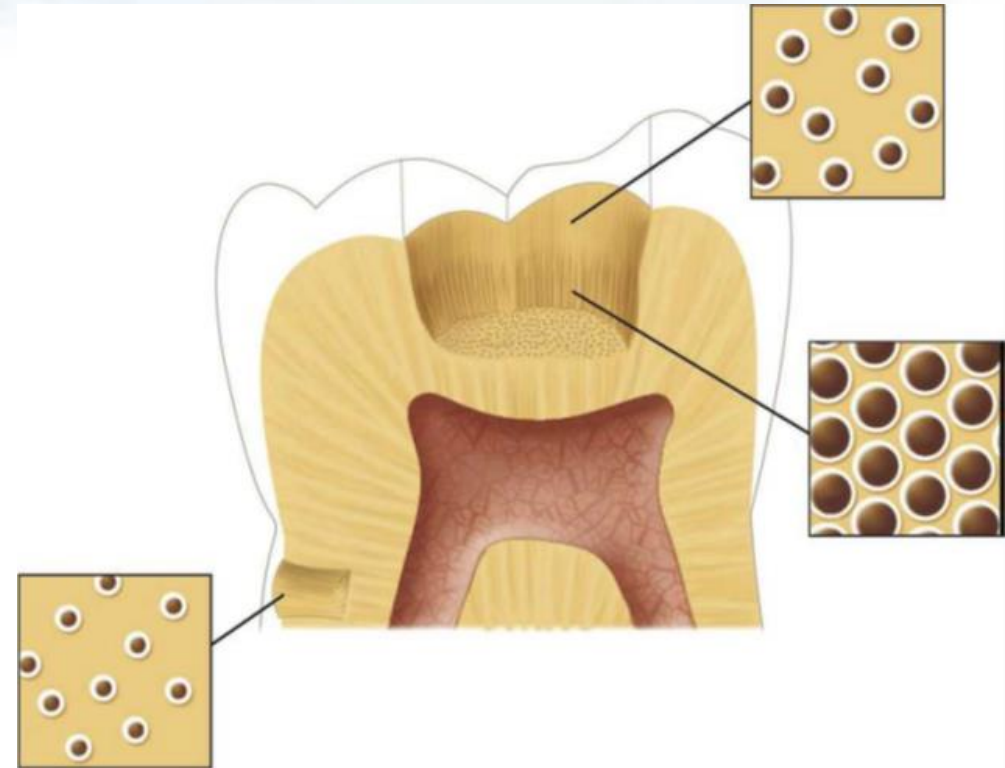
- ✓ Traditional concept: **Replacing** diseased tooth/pulp tissues by inert materials
- ✓ Recent advances: **Regenerative strategies** to generate new vital tissue

Pulp Necrosis & Root Development

- Root Development continues 2 to 3 years after the eruption of a permanent tooth



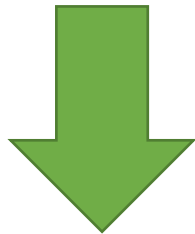
- Invading Micro-organisms results in pulp inflammation and eventually pulp necrosis
- Caries advancement in dentin up to 1.5 mm of the pulp results in pulpal inflammation & diffusion of bacterial antigens through dentinal tubules



The effect of Residual Dentin Thickness in protecting Pulp Tissue.

What Happens to a Pulpless Tooth?

- Losing Structure due to endodontic & restorative treatments
- Minimal Moisture depletion and stiffness reduction
- Lack of proprio-receptors and presso-receptors: No protection against excessive occlusal loadings
- Risk of recurrent caries due to poor marginal integrity & altered microflora



Vulnerable to Fracture recurrent
caries

- 
- **Vital pulp therapy** aims to preserve and maintain pulpal health in teeth challenged by

- trauma,*

- caries,*

- restorative procedures,*

- anatomic anomalies*

- Primary objective: initiate the formation of new mineralized tissue
- Correlation of clinical symptoms with the pathophysiologic status of the dental pulp?
- May not be a suitable treatment plan for all cases

AAE Position Statement On VPT 2021

- The viewpoint that VPT is an option only for cases where testing results were consistent with “reversible pulpitis” has recently been challenged.
- Utilizing direct visualization of the pulp, it appears that even *symptomatic pulps* may be candidates for VPT



Biomaterials

- First reported Direct Pulp Capping Procedure with Gold Foil, by Philip Pfaff 1756
- New Materials with superior sealing Properties: Calcium Hydroxide to MTA and new Hydraulic Tricalcium Silicate Cements (CSCs)



Calcium Hydroxide



ProRoot MTA (Grey)



Proroot MTA (White)



CEM Cement



Biodentin

- Crown Discoloration
- Setting Time
- Handling

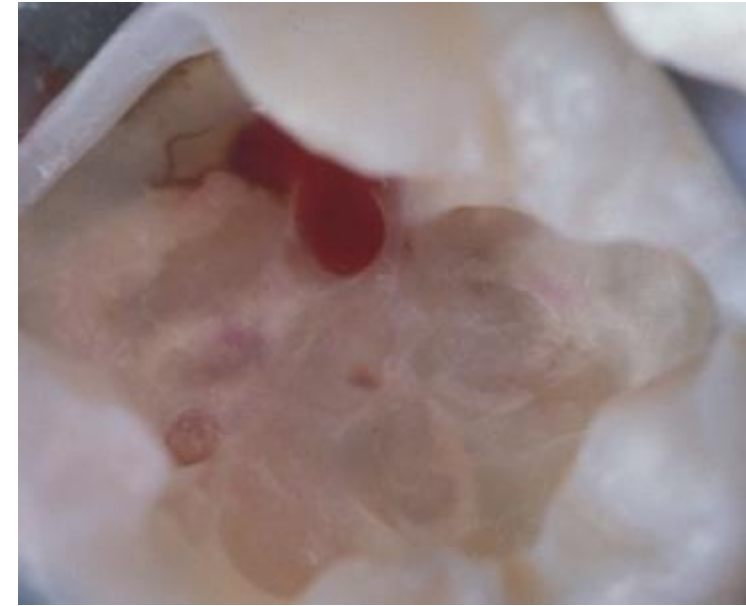
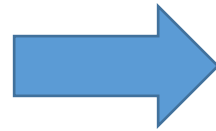
Vital Pulp Therapy (VPT)

- Biologically based therapy

- 1. Pulp Capping Procedures
- 2. Pulpotomy Procedures



- Differ in Invasiveness
- Assessment of the clinician on the extent of Inflammation
- Diagnosis Based on Sign & Symptoms

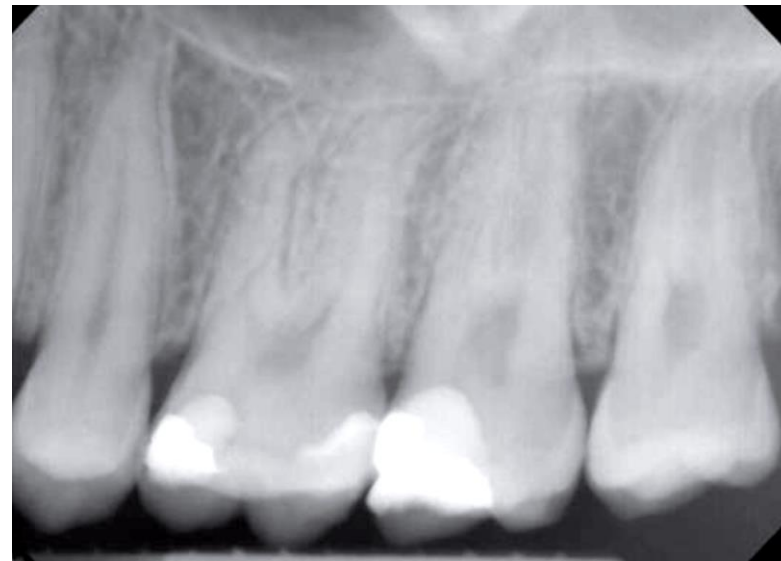
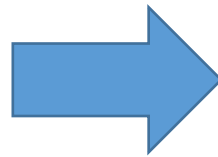


- ## Chairside Subjective Assessment
- Clinical Tests & Diagnosis
 - Pulpal Hemorrhage
 - High-power Magnification and Illumination

Indirect Pulp Capping

- Applicable in:
 1. Deep Caries with normal pulpal status (*No signs of Pulpitis*)
 2. Uncomplicated Crown Fractures
- Infected dentin removal using Caries Detector
- cavity preparations with residual dentin thickness(RDT) of at least 0.5 mm from the pulp could be successfully capped with a bioactive material, resulting in the desirable formation of *reactionary* dentin, particularly in young patients.

- Step-wise Caries Excavation, Residual Soft Dentin and Tertiary Dentin Formation
- Infected peripheral Dentin Excavated
- Remaining Carious Dentin lined with Calcium Hydroxide(CH) & Resin-Modified Glass Ionomer (RMGI), 8-12 weeks later Re-entry and Permanent Restoration
- Close Follow-up: check pulp vitality and asymptomatic patient



Caries Management AAE Guideline 2021

- Complete caries removal is essential
- Predictable management of vital pulp tissue should not be performed without complete removal of both demineralized enamel and infected dentin.



Direct Pulp Capping

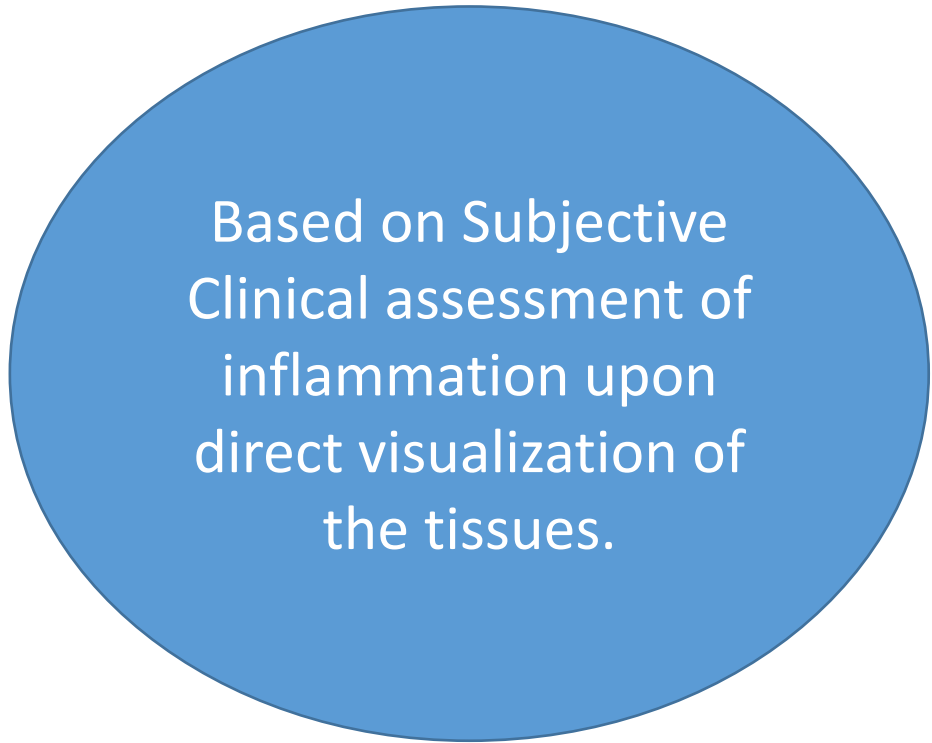
- In pulp exposures without major contamination
 1. *Mechanical exposure during cavity preparation*
 2. *Traumatic injuries: up to 24 hrs after trauma*
- Lower success rate in cases with long-standing carious exposures
- Cover the exposure site with bioactive material

Pulpotomy



1. Partial Pulpotomy
(Cvek Pulpotomy)
Shallow Pulpotomy

2. Full Pulpotomy
Pulp Chamber
Pulpotomy



Based on Subjective
Clinical assessment of
inflammation upon
direct visualization of
the tissues.

- Indications of Partial & Full Pulpotomy
Traumatic Pulp Exposure after 72 hrs
Carious Exposures in Permanent Teeth
Dental Anomalies (Partial)



Based on pulpal
hemorrhage during the
procedure



Dens
Evagination



Steps for VPT Procedures

- Anesthesia
- Crown Disinfection with Chlorhexidine or NaOCl
- Rubber Dam Isolation
- Caries Removal using a slow-speed round bur, under magnification
- Immersion of cavity and exposure sites with 1.5-5.25% NaOCl

Exposure Site

No Bleeding

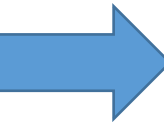
Heavy Bleeding

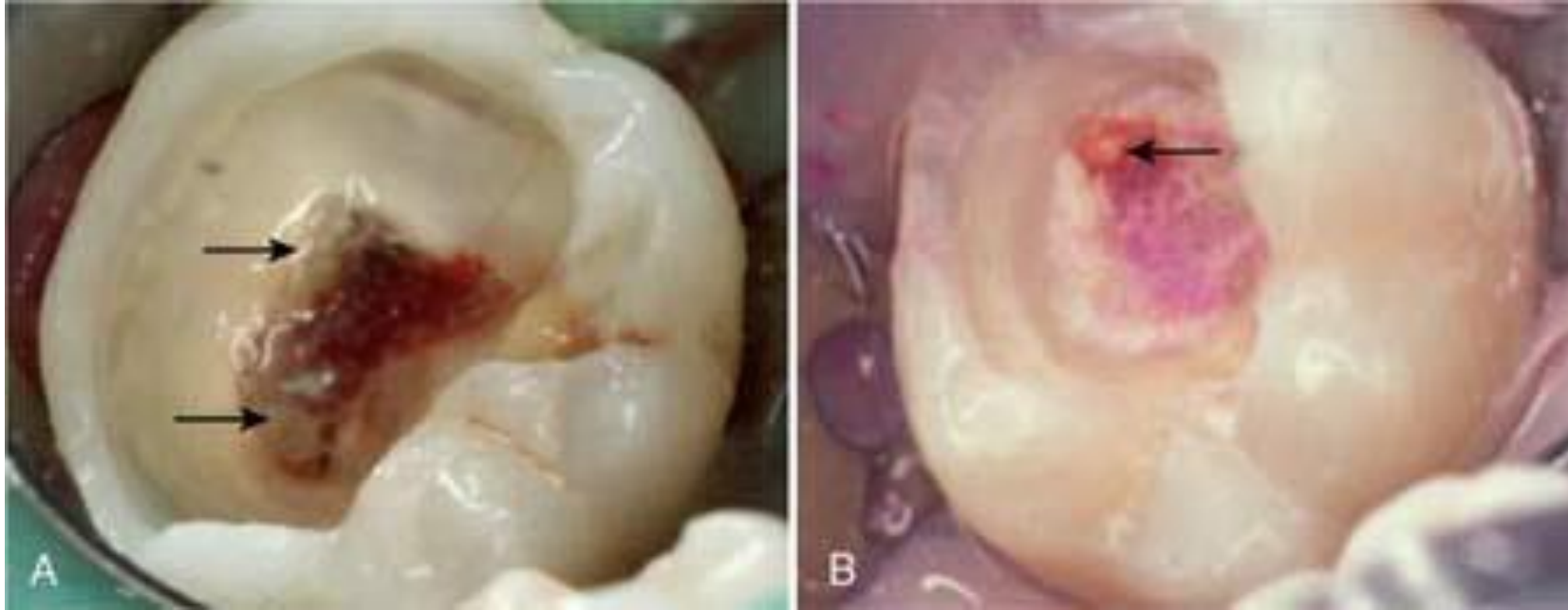
Necrotic Tissue

Inflamed Irreversible Pulp Tissue


Remove with ***High-speed Round Diamond Bur*** until bleeding tissue is exposed

Apply Cotton Pellet moistened with NaOCl under moderate Pressure for 5-10 Min



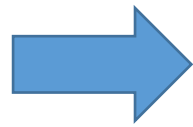


Clinical examples of diseased pulp tissues after sodium hypochlorite hemostasis.



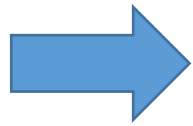
Apply Cotton Pellet moistened
with NaOCl under moderate
Pressure for 5-10 Min

Bleeding Stops



Apply MTA or Calcium
Silicate Cements
(CSCs)

Bleeding Does not
Stop after 10 min



Consider Full Pulpotomy or
Pulpectomy Based on the degree
of Inflammation

- Apply MTA or CSCs at a 1.5-3 mm thickness including most of the surrounding dentin
- Remove Excess Moisture with a dry cotton Pellet and leave a clean periphery of dentin for bonding agents
- Apply a Flowable Compomer/ RMGI/ Flowable Composite resin layer to cover the CSC.
- Composite Restoration
- Torabinejad: MTA thickness > 4mm for Full Pulpotomies

- Check Pulp Vitality 7-10 days with a Cold Test
- Radiographic assessment needed only in negative sensibility test or onset of pain/ yearly or every 2 yrs. assessment
- Torabinejhad: 6 & 12 months reevaluation followed by annual reevaluations for first 4 yrs.

MTA Preparation



3:1 Powder to Liquid Ratio
Thick Creamy (Sandy)
Consistency







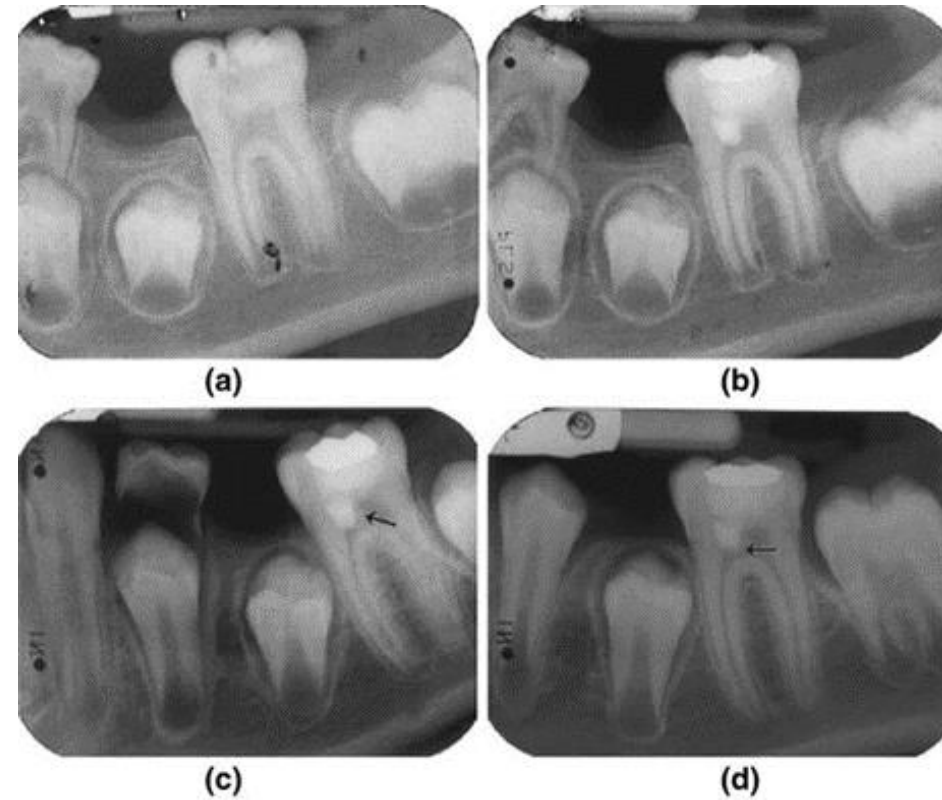


Canal Calcification after VPT

- A diagnosis of Irreversible pulpitis based on Sign & Symptoms does not preclude VPT options.
- History of trauma/ previous restoration/ pulp calcification have poorer prognosis than teeth with initial caries
- Consider remaining tooth structure and future restorative plan.

Apexogenesis

- Any VPT procedure in immature permanent teeth
- Allows Continued Root formation, Increased Root Thickness and Length



Thanks for your Attention

