

Diagnostic Dilemma in deep caries management

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Diagnostic values topic include.....

- Diagnosis of dental pulp status
- Diagnostic dilemma
- Right treatment choice based on diagnosis
- Review of treatment options in primary & immature permanent teeth

Treatment objectives

Primary:

1. **Keep tooth in function** as long as they are important in occlusal development
2. **Protect underlying permanent teeth bud**

Immature permanent teeth:

1. **Maintain continuing root development**
2. **Keep the tooth functional in dentition**

Clinical diagnostic Methods

Listen to your patients.... The patients will give you the diagnosis
(sir william Osler)

- Medical and Dental History
- Clinical test
- Radiographic evaluation

Medical history

1. **Relevant medical conditions** that requires attention need physician clearance
2. Update recommendations of AHA

Dental history

1. **Pain & symptoms**

Ask the patient about.....Pain

- Kind of pain: Sharp or dull
- Ability to localize to specific tooth (sharp pain)
- Pain is diffuse: Patient finger moves along the dental arch (dull pain)

Duration of pain

1. Reversible : Acute reversible pulpitis
2. Irreversible : Irreversible pulpitis
3. Spontaneous : Irreversible pulpitis

Clinical test

- Visual and tactile inspection
- Percussion
- Palpation
- Mobility
- Bite test (cracked tooth)
- Electric pulp test
- Thermal test
- Radiograph

Visual and tactile inspection:

Color :- Tooth

Contour :- Fracture and wear facets

Consistency :- Caries

Percussion :

Positive response indicates acute apical periodontitis. When apical periodontitis occurs unrelated to a periodontal cause it is usually as a result of pulp necrosis.

Palpation:

Tissue consistency and pain response. Its value lies in locating the swelling in relation to the involved tooth.

Mobility test:-

Determine whether the tooth is firmly or loosely attached to its alveolus. The amount of movement indicates the condition of the periodontium. Endo treatment is not recommended on a tooth with grade three mobility.

Bite Test (cracked tooth):-

Used to diagnose cracked tooth or fractured cusp. Patient is asked to bite on the fracture finder. Pain on biting indicates apical periodontitis if there is pain on release of biting force it is diagnostic of cracked tooth

Electric pulp test

False positive response:

Moist necrotic pulp present in the root canal

False negative response:

Calcification in the pulp or extensive dentin

Factors affecting response:

Large restorations

Recent trauma

Incomplete root formation (children)

High pain threshold



Source of Image: Cohen's Pathways of the Pulp Expert Consult, 11th Edition; Kenneth M. Hargreaves & Louis H. Berman

Thermal testing



Heat

- Burnisher/ water/ compound/gutta-percha
- Abnormal response indicates pulpal or periapical disorder
- Pain is localized or diffuse and at times referred



Cold

- Ethyl chloride- sprayed cotton pellet, pencil of ice, dry ice
- Response indicates vital pulp
- Patient can point the painful tooth

Source of Image: Cohen's Pathways of the Pulp
Expert Consult, 11th Edition; Kenneth M. Hargreaves
& Louis H. Berman

Assessment of Pulp Oxygen Saturation Levels by Pulse Oximetry

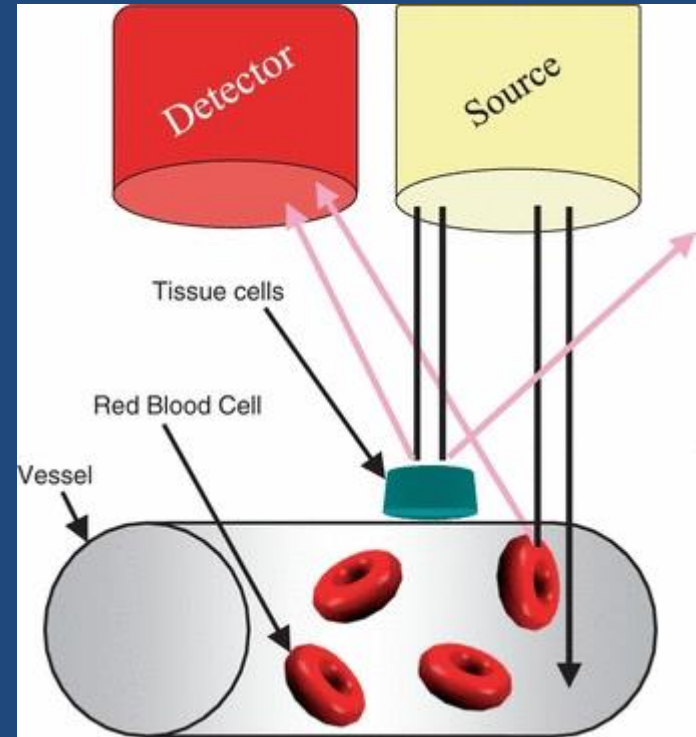
Pulse oximetry is a true vitality testing device in diagnosing different pulpal inflammatory conditions. Pulse oximetry serves in detecting the vitality of pulpally necrosed teeth which cannot be detected by thermal tests.



Anusha *et.al* 2017

Laser Doppler flowmetry

Vascular supply is the most accurate marker of pulp vitality. Tests for assessing vascular supply that rely on the passage of light through a tooth. This method is non invasive, objective, painless, semi-quantitative method, has been shown to be reliable for measuring pulpal blood flow. Laser light is transmitted to the pulp by means of a fibre optic probe. Scattered light from moving red blood cells will be frequency-shifted whilst that from the static tissue remains unshifted. The reflected light, composed of Doppler-shifted and unshifted light, is returned by afferent fibres and a signal is produced.



Jafarzadeh H 2009

Radiograph's are used to

- Caries detection and involvement of pulp
- Root canals
- Calcification/ obliteration
- Thickening of periodontal ligament
- Extent of periapical and alveolar bone loss
- Diagnostic aid in endodontic treatment

At times radiographs can be misleading

- Not reliable to differentiate chronic abscess, granuloma, cyst
- At times rarefactions at the root apex could be superimposition of image
- Periapical lesions are larger than they appear on the x-ray. (6.6% mineral loss for detection)

OPG help in diagnosis and treatment planning in Pediatric dentistry

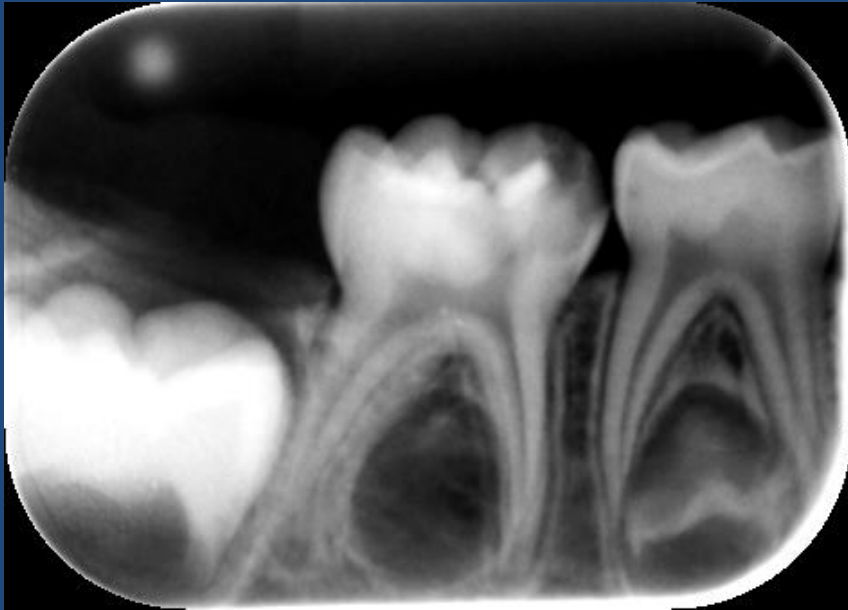


Use of Radiographs in Primary dentition

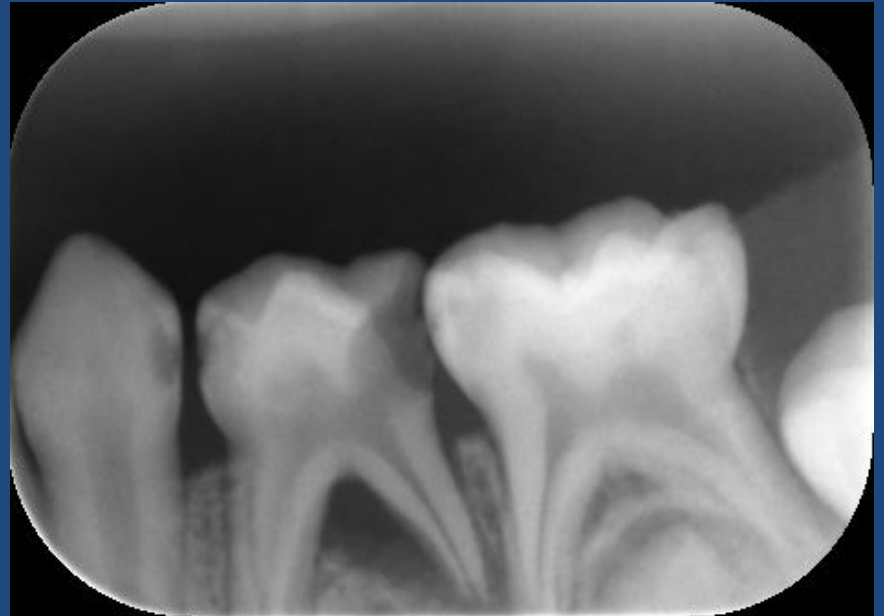
1. Closed primary dentition :- Bite wing radiographs are used to detect proximal caries
2. Periapical X-rays are used to determine the extent of caries and its relation to pulp and to determine inter radicular and periapical involvement.

Diagnosis in primary dentition

10 % inter-radicular involvement



> 80% inter-radicular involvement

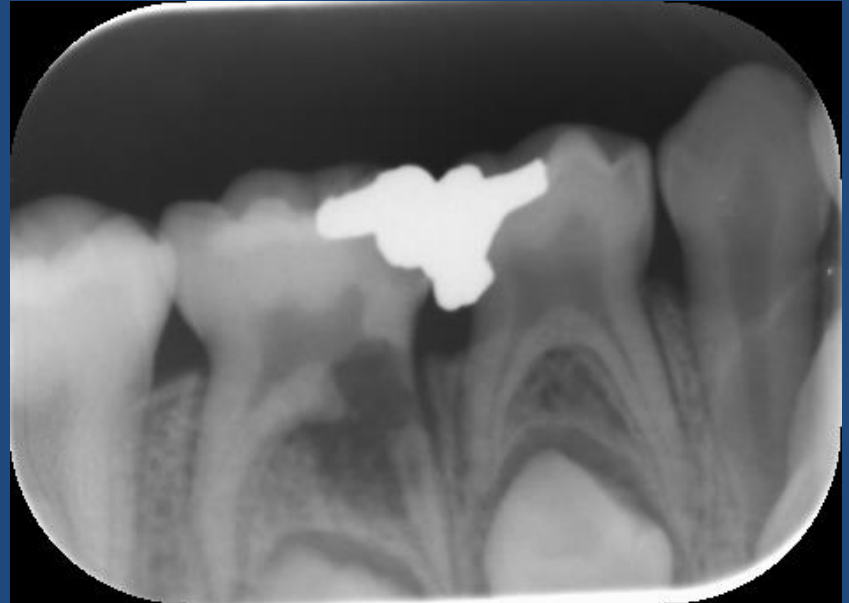


Diagnosis in mixed dentition

Perforation detected



Internal resorption



Diagnosis in permanent dentition

Occult caries in second molar



Non-vital immature incisors



Diagnostic dilemma

- Pulp status is categorized based on signs & symptoms and on the test results.
- At times in children this information is not reliable
- Managing dental caries is demanding due to the dilemma present on the right diagnosis

Diagnostic dilemma present on the inflammatory condition of the pulp will affect the prognosis of endodontic and restorative treatment in primary teeth.

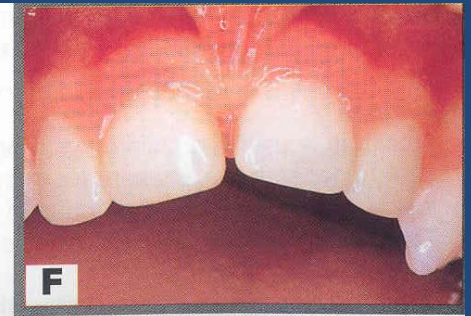
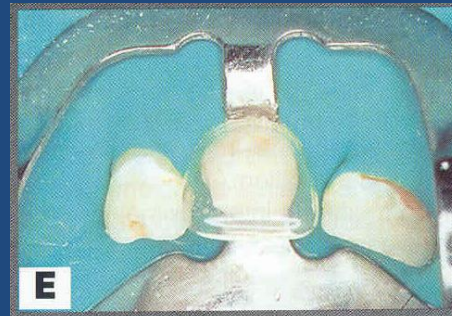
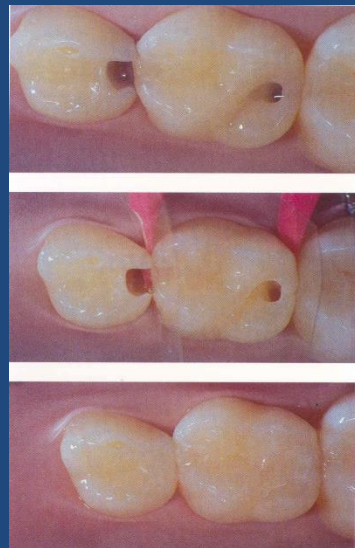
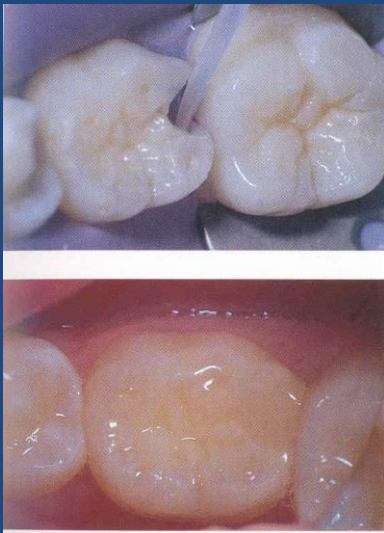
**RESTORATION/ INDIRECT PULP
CAPPING/ PULPOTOMY/ PULPECTOMY**

Treatment options in primary teeth based on diagnosis

1. Restorations in primary teeth:

Diagnosis:

- RDT of $> 1\text{mm}$
- inter-radicular /apical regions normal
- no signs of pain with healthy periodontium

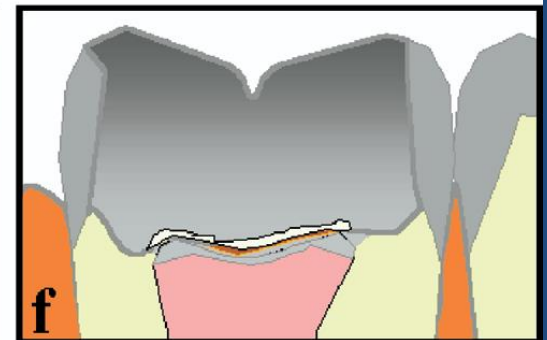
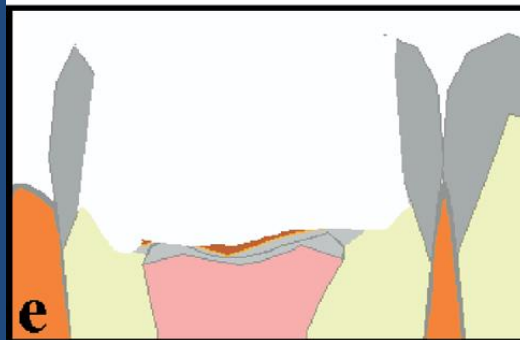
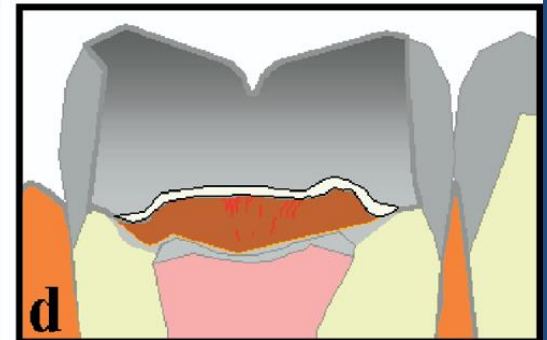
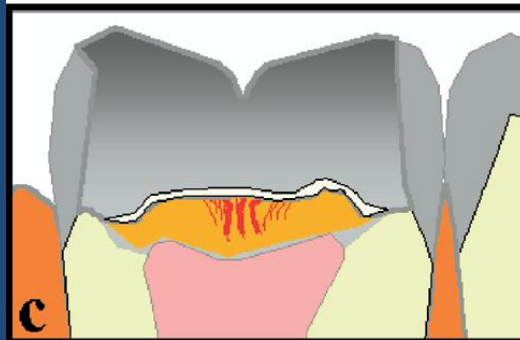
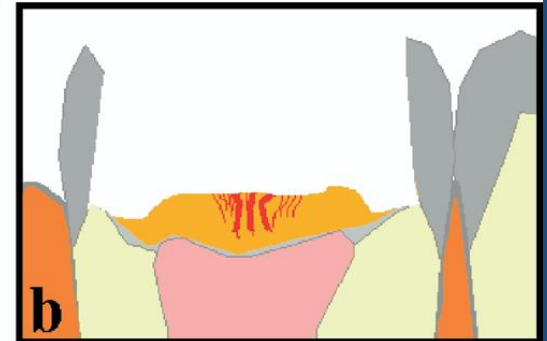


Source of Image: Handbook of Pediatric Dentistry. (Fourth Edition). Edited by: Angus C. Cameron and Richard P. Widmer ISBN: 978-0-7234-3695-9

2. Indirect pulp capping (primary)

Diagnosis:

- RDT of $\leq 1\text{mm}$
- inter-radicular /apical regions normal
- No pain
- Arrested/inactive caries
- Healthy periodontium



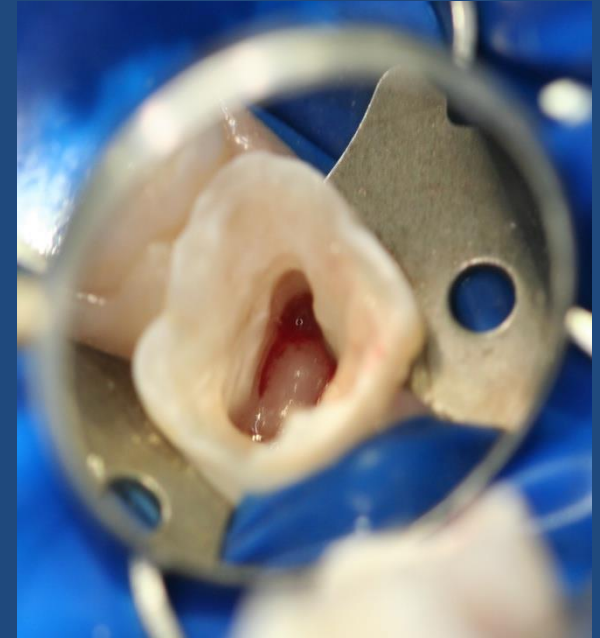
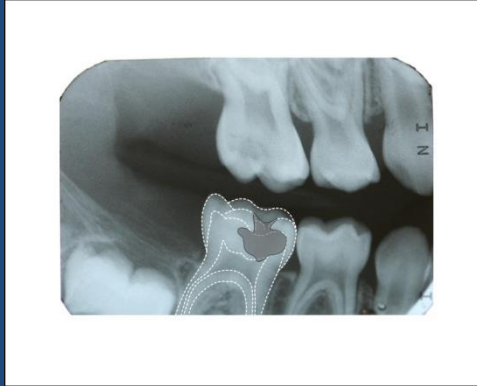
Stepwise excavation technique :

1. Deep lesion could exposure pulp if treated by a single excavation.
2. No history of spontaneous pain and provoked pulpal pain, however mild to moderate pain on thermal stimulation is accepted.
3. Positive pulp sensibility tested by an electric pulp tester, thermal stimulation.
4. Pretreatment radiographs that rule out apical pathosis.
5. Finish the peripheral excavation of the cavity followed by a central excavation removing the outermost infected dentin, in order that a provisional restoration can be placed.
6. Do not excavate as closely as possible during the first step, thereby reducing the risk of pulp exposure.
7. Select a provisional restorative material on the basis of the length of the treatment interval, ranging between 6 and 8 months.
8. The final excavation is often less invasive than expected, as a result of the altered dentinal changes gained during the treatment interval.

3. Pulpotomy (Primary)

Diagnosis:

- RDT of $< 1\text{mm}$
- Minimum inter-radicular rarefactions present
- Apical regions normal
- signs of reversible pulpitis
- Healthy periodontium



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4. Single visit Pulpectomy (Primary)

Diagnosis:

- RDT of < 1mm
- Minimum inter-radicular rarefactions present
- Apical regions normal
- signs of irreversible pulpitis
- Healthy periodontium



5. Multiple visit pulpectomy

Diagnosis:

- RDT of < 1mm
- Inter-radicular rarefactions present
- Apical rarefactions present
- signs of irreversible pulpitis /necrosis
- Gingiva inflamed and a abscess present



- a. Multiple visit pulpectomy on first primary molar
- b. Extraction of second primary molar



Treatment options in permanent teeth based on diagnosis

- Restorations
- Indirect pulp capping
- Pulpotomy – Apexogenesis
- Regenerative endodontics

Pulpotomy – Apexogenesis

Diagnosis:

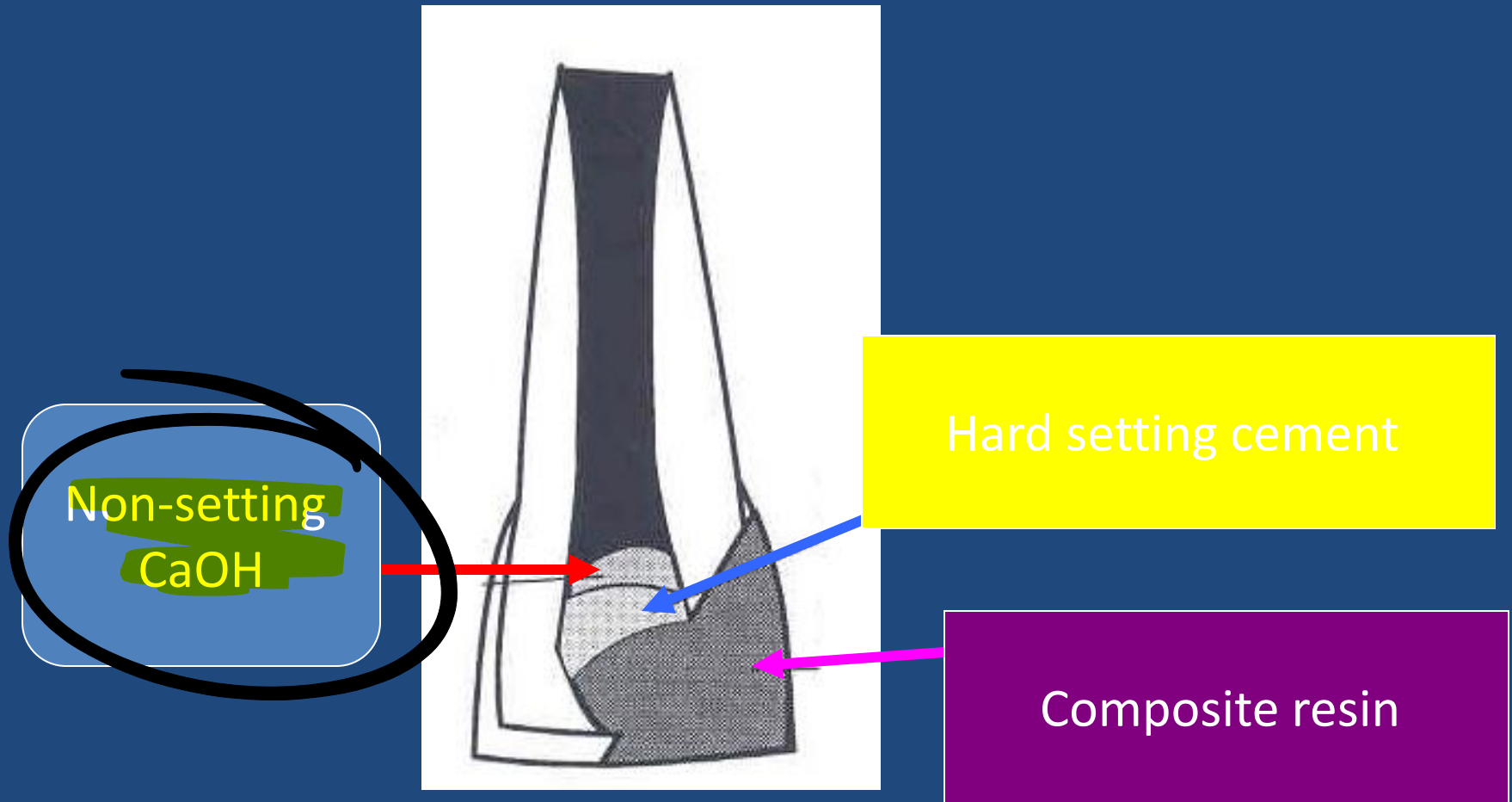
- Vital young permanent tooth with incomplete root formation
- Exposed coronal pulp as a result of trauma /caries
- Signs of reversible pulpitis in case of caries exposure
- Healthy periodontium



Why do it?

To preserve vital, non-inflamed pulp tissue, biologically walled off by a hard tissue barrier

Dressing the pulpal wound to promote calcific repair



The tooth at review



Root formation
complete

Calcific barrier
formation

Regenerative endodontics

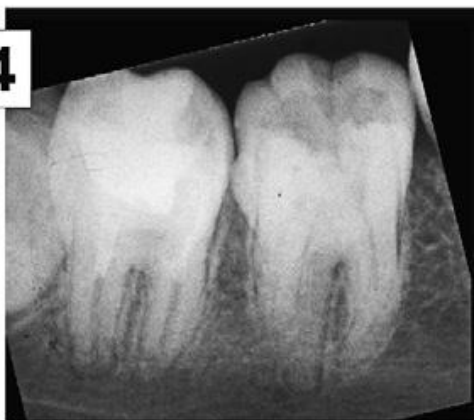
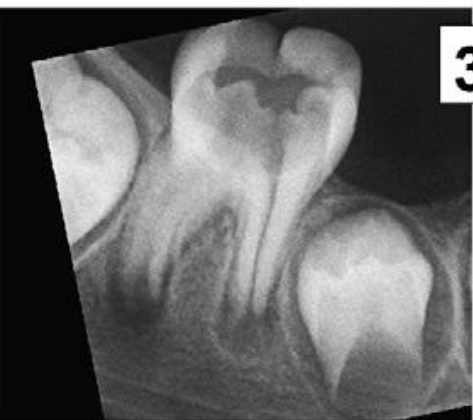
Diagnostic criteria:

1. Necrotic young permanent tooth with open apex / incomplete root formation
2. Negative to pulp vitality testing.



Regenerative endodontics

Necrotic permanent first molars revascularization protocol include 2.5% NaOCl irrigation, Ca(OH)_2 medication in the coronal third of the root canals for 3 weeks, induction of apical bleeding, coronal sealing with white MTA. Radiographs taken after 9 to 10 months.....
(Cehreli et.al 2011)



Necrotic immature teeth

- NaOCl irrigation and treatment with triple antibiotic paste
- After 1 month bleeding was evoked and sample collected with paper points.
- Molecular analyses of blood collected indicated stem cell marker CD 73 and CD 105 up by 600-fold compared with systemic blood.
- These cells contribute to the regeneration of pulp tissues and root development

Summary:

- Differentiation is essential not only between vital and non-vital pulp but also between healthy pulp tissues and total or partially inflamed pulp.
- Diagnostic dilemma exists on the pulp inflammatory status in caries exposure.
- Appropriate diagnosis is a valuable tool in selecting the right treatment choice which could enhance prognosis.

Reference:

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Thank you for your attention !!!!



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