



VITAL PULP THERAPY OF IMMATURE PERMANENT TEETH

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- The most important, and most difficult, aspect of pulp therapy is determining the health of the pulp or its stage of inflammation
- Permanent teeth in children and adolescents have a more cellular pulp and a rich vascular supply
- root development will affect the treatment plan
- Immature permanent teeth from 6 years of age until 3 years after the eruption of the third molars

SECONDARY DENTIN

- Physiologic secondary dentinogenesis represents the deposition of dentin after completion of the crown and root formation
- young permanent teeth have wide root canals, and dentin apposition can prevent fracture
- **The aim of all treatment planning for young permanent teeth is to preserve pulp vitality**

REACTIONS TO CARIES AND OPERATIVE PROCEDURES

- The molecular and cellular changes that take place during primary dentinogenesis are mimicked during the dentin-pulp reactions to injury
- Tertiary dentin has been classified as either reactionary or reparative
- various factors associated with the method of cavity preparation and restoration can influence the tertiary dentin response
- The size of the cavity,
- **the residual dentin thickness** (RDT), the etching of the cavity, and the type and method of application of the restorative material have an effect on the type and quality of the tertiary dentin.

CLINICAL PULPAL DIAGNOSIS

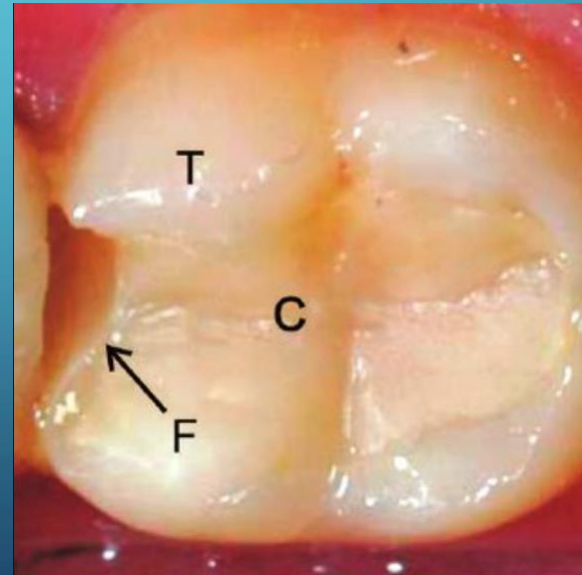
- Patient history :assessing the type of pain described by the child is important
- Sensitivity to pressure
- Children often complain of “toothaches” during the eruption of the first permanent molars
- Food impaction

CLINICAL EXAMINATION

- Both extraoral and intraoral examinations are important
- Extraoral examination should focus on swelling, local lymphadenopathy, and extraoral sinus tract
- Intraoral examination should focus on the tooth suspected as the origin of pain, but all the teeth on the same side should be inspected carefully, because referred pain

CLINICAL EXAMINATION

- Tooth discoloration is important
- Special attention should be paid to fractured restorations or those with marginal breakdown, as these may also be indicators of pulp involvement
- Additional tests should include thermal and electric pulp test (EPT) of the involved tooth and of an appropriate control tooth.
- **Cold test has been found more reliable in immature permanent teeth**
- Periodontal probing is part of the intraoral examination; bone loss can be a consequence of reversible (treatable) or irreversible (untreatable) pulpitis



IRREVERSIBLE PULPITIS

- immature permanent teeth should be carefully considered for pulpotomy, apexogenesis, or regenerative treatment, in an attempt to enable further tooth development

RADIOGRAPHIC EXAMINATION

- In a young child, a vertical bitewing with a small size radiograph can be used instead of a periapical radiograph
- additional radiograph of the antimeres should be taken for comparison
- root canals of permanent teeth are wider in the buccolingual plane than the mesiodistal
- CBCT should only be used when the question for which imaging is required cannot be answered adequately by lower dose conventional dental radiography or alternate imaging modalities.

- Lateral external inflammatory root resorption is a common finding in necrotic young teeth after trauma. External replacement root resorption can also be seen after traumatic injuries

DIRECT PULP EVALUATION

- a final diagnosis can only be reached by direct visualization of the pulp tissue
- profuse or deep purple-colored bleeding or pus exudate indicates irreversible pulpitis

- (International Caries Consensus Collaboration [ICCC]) agreed that it would be ideal to relate the visual, clinical appearance of the lesion directly to what is taking place histopathologically
- Soft dentin :a hard instrument is pressed onto it and can be easily scooped up
- Leathery dentin :this dentin does not deform
- Firm dentin: physically resistant to hand excavation, and some pressure needs to be
- Hard dentin: A pushing force needs to be used with a hard instrument/*scratchy sound*

- *Nonselective removal to hard dentin*
- *Selective removal to firm dentin* :(radiographically extending less than the pulpal third or quarter of dentin)
- *Selective removal to soft dentin* :(radiographically extending into the pulpal third or quarter of dentin)
- *Stepwise removal : 12 month*

SELECTIVE CARIES REMOVAL TO SOFT DENTIN— INDIRECT PULP TREATMENT

- The main objective of IPT is to maintain the vitality of teeth with reversible pulp injury or teeth with deep caries
- The rationale for this treatment is based on the observation that postmitotic odontoblasts can be induced to upregulate their secretory activities in response to reduced infectious challenge

- It is important to remove the carious tissue completely from the dentinoenamel junction and from the lateral walls
- The materials used for these procedures are calcium hydroxide liners and glass ionomer liners
- The preferred tool for caries excavation is a large carbide round bur (no. 6 or 8), because the bur allows better control of the “partial removal caries step” than spoon excavators do. Use of a bur also results in a significant reduction in viable counts of both *Streptococcus mutans* and lactobacilli



Fig 3.



Fig 4.

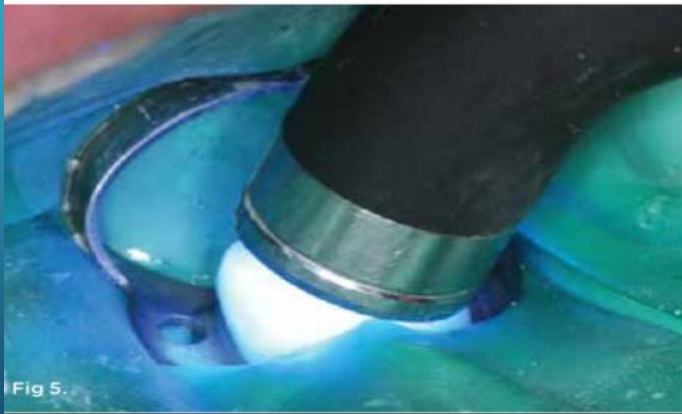


Fig 5.

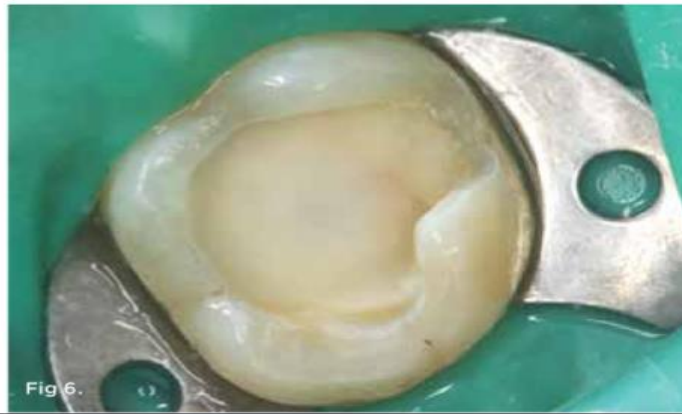


Fig 6.

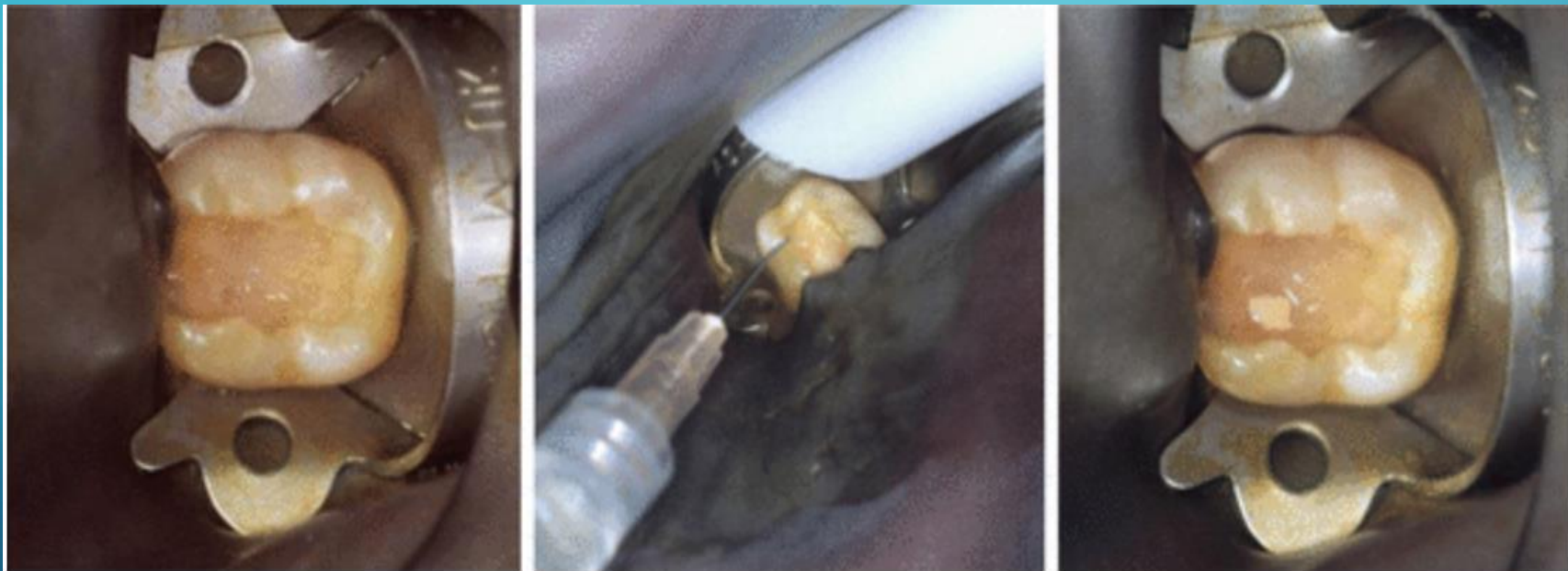
VITAL PULP THERAPY FOR TEETH DIAGNOSED WITH NORMAL PULP OR REVERSIBLE PULPITIS WITH PULP EXPOSURE (DIRECT PULP CAPPING)

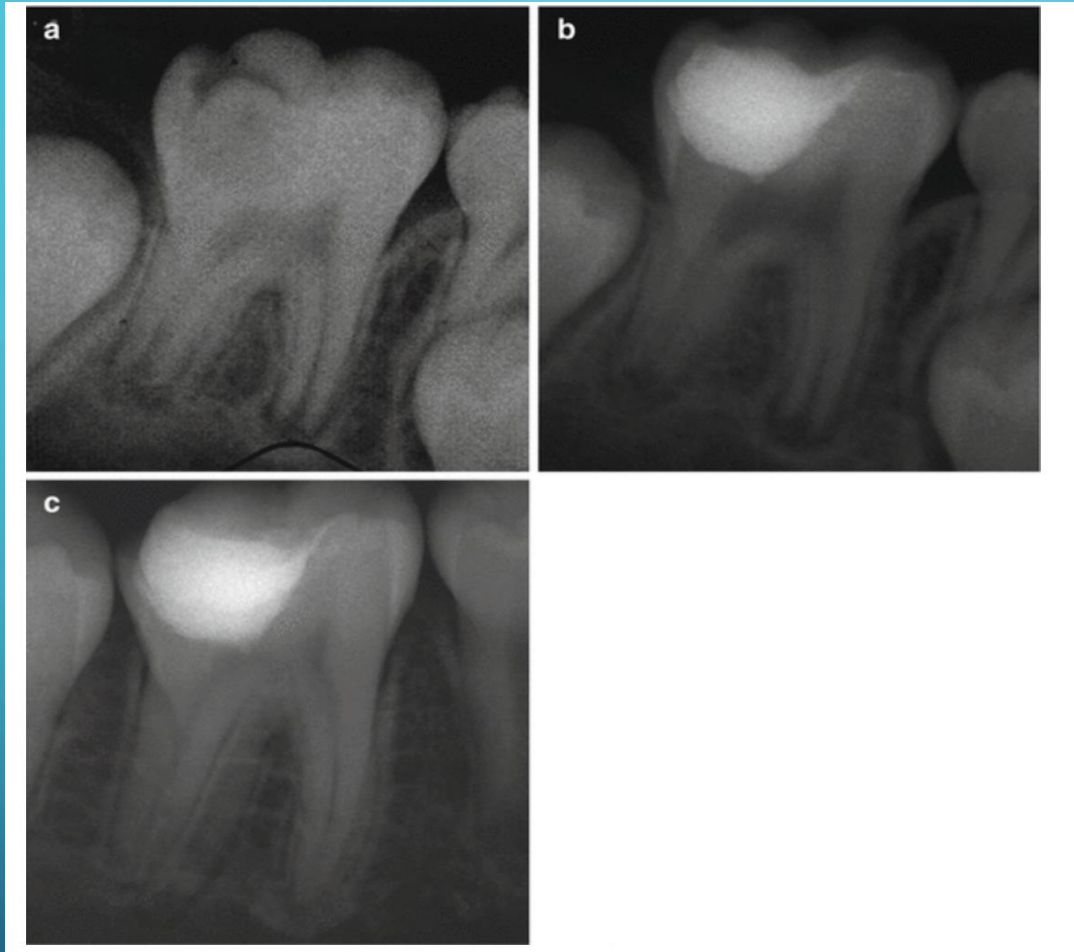
- small exposure of the pulp is encountered during cavity preparation in teeth with a normal pulp or reversible pulpitis. Direct capping may also be used after a recent clean fracture due to a traumatic injury
- When direct pulp capping is indicated, it should be performed immediately after the exposure to prevent contamination of the pulp
- **Mineral trioxide aggregate (MTA) and calcium hydroxide** are the most frequently recommended capping materials

- MTA presents a major drawback by staining tooth material
- in teeth where there is an esthetic concern. In these teeth, alternatives to MTA (such as calcium hydroxide) should be considered
- Direct pulp capping should always be followed by an immediate and definitive restoration

DIRECT PULP CAPPING TECHNIQUE

- isolated with a rubber dam and disinfected with sodium hypochlorite(NaOCl)
- cavity preparation with high-speed burs and caries removal with slow-speed burs
- cavity should be rinsed with NaOCl (every 3 to 4 minutes)
- If the bleeding cannot be stopped within 1 to 10 minutes?
- MTA should be placed directly over the exposed pulp tissue (1.5 to 2 mm thick). The material should then be covered with a glass ionomer liner followed by a permanent restoration



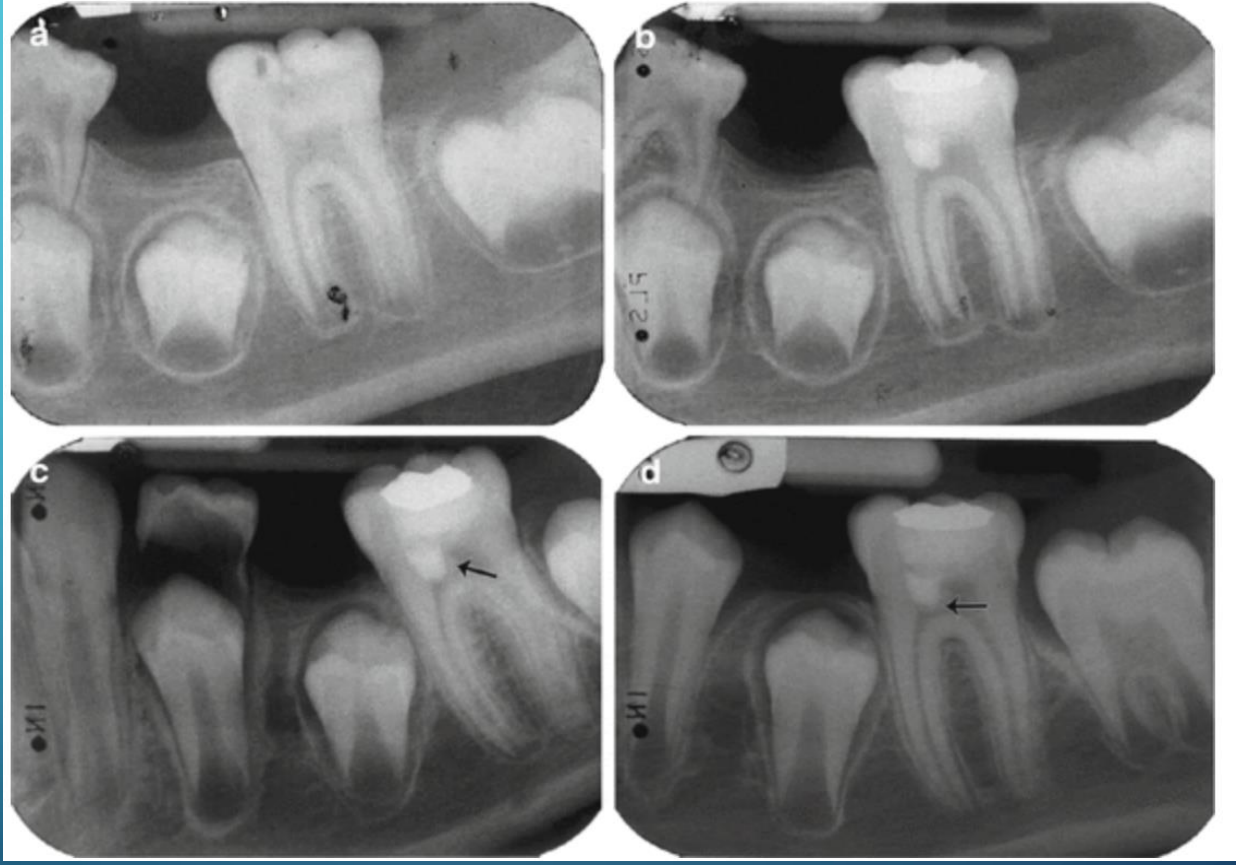


THE PULPOTOMY PROCEDURE

- partial pulpotomy and full (cervical) pulpotomy provide a more predictable outcome than direct pulp capping in teeth with carious exposure
- Traumatized exposure/carious exposure
- After pulp
- amputation, the preparation is thoroughly washed with NaOCl to disinfect and control hemorrhage

THE PULPOTOMY PROCEDURE

- If hemorrhage persists amputation should be performed at a more apical level
- Once hemorrhage has been controlled and the blood clot removed, a dressing of MTA (or calcium hydroxide in an esthetic area) is gently placed over the amputation site.
- Care should be taken not to push the material into the pulp. The MTA should be covered with a glass ionomer liner, and a permanent restoration should be placed



APEXOGENESIS

- Apexogenesis is indicated in immature teeth when only part of the pulp tissue inside the root canal remains vital and apparently healthy
- The root formed may be irregular but nevertheless provides additional support for the tooth
- Apexogenesis can be regarded as a very deep pulpotomy.
- MTA, another type of bioceramic material, or calcium hydroxide is placed over the vital pulp stump after hemostasis control with NaOCl but before the formation of a blood clot

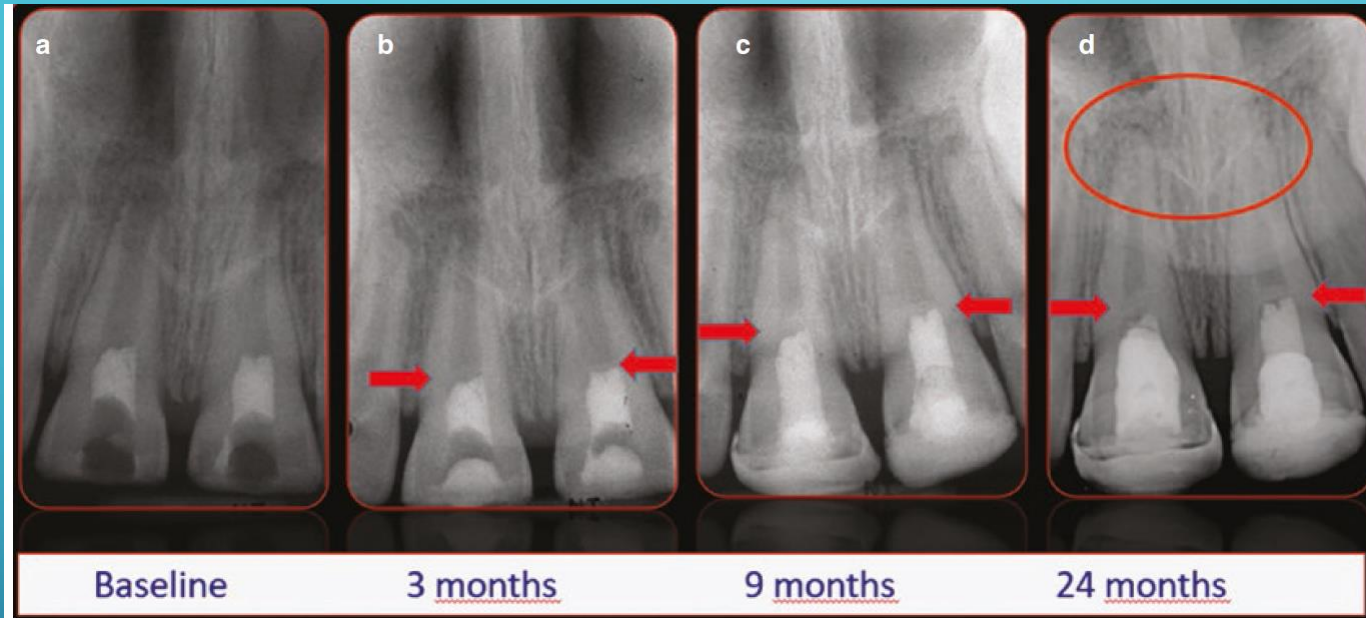




Figure 1. (A) Preoperative radiograph; (B) after pulp capping with CEM cement; (C) after restoring the tooth with separated segment; (D) recall 6 months after

The background is a dark blue gradient. In the corners, there are white line-art illustrations of circuit boards or neural networks, consisting of lines and small circles.

Thanks for your attention