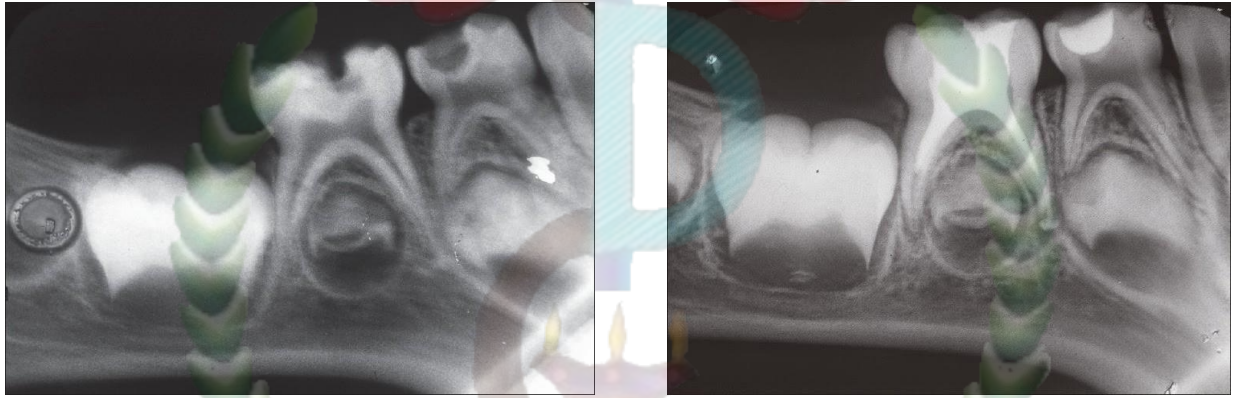
DEPARTMENT OF PAEDIATRIC AND PREVENTIVE DENTISTRY

Pulp Therapy in Pediatric Dentistry – 2



Learning Objectives

- Vital pulp therapies for primary teeth with normal pulp or reversible pulpitis include protective liner, indirect pulp treatment, direct pulp cap, and pulpotomy.

- Vital pulp therapy for immature permanent teeth with a normal pulp or pulpitis include protective liners, apexogenesis, indirect pulp treatment, direct pulp cap, partial pulpotomy, and complete pulpotomy.

Index

- Classification of pulp therapy in Paediatric Dentistry
- Indirect pulp capping
- Direct pulp capping

Classification of pulp therapy in Pediatric Dentistry

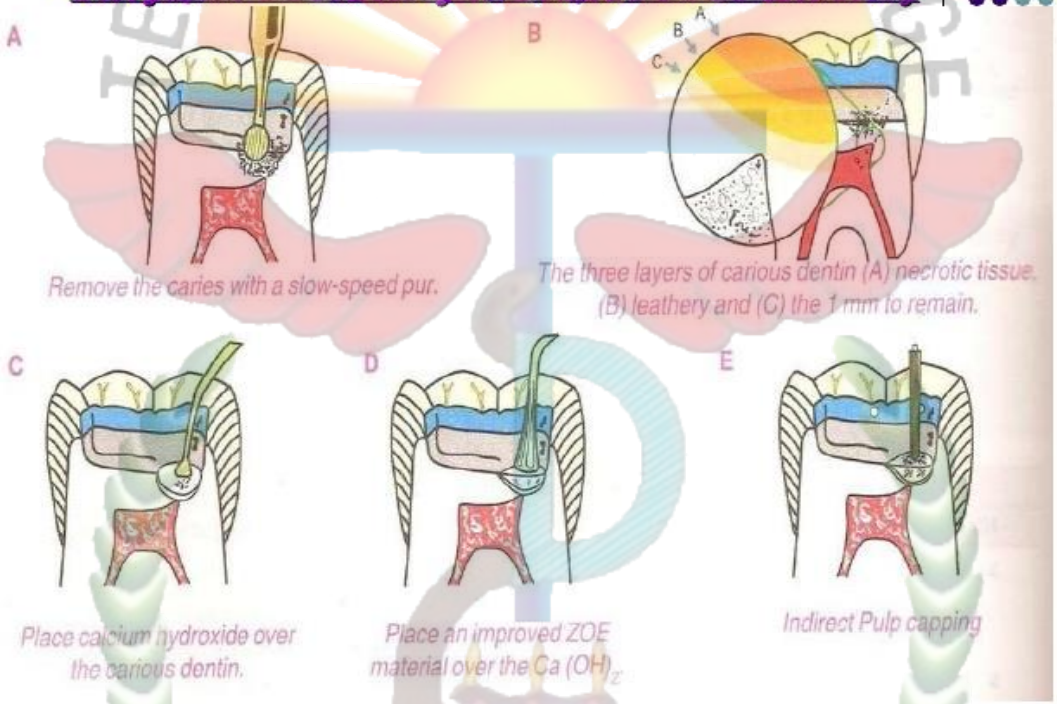
Primary teeth	Permanent teeth
Vital pulp therapy •Indirect pulp capping/treatment (IPT) •Direct pulp capping/treatment (DPT) •Pulpotomy	Vital pulp therapy •Indirect pulp capping/treatment (IPT) •Direct pulp capping/treatment (DPT) •Pulpotomy
Non vital pulp therapy •Partial pulpectomy	Non vital pulp therapy •Root canal treatment •Apexification
	Regenerative endodontic therapy Revascularization

Indirect Pulp Capping

Definition

- The procedure involving a tooth with a deep carious lesion where carious dentin removal is left incomplete, and the decay process is treated with a biocompatible material for sometime in order to avoid pulp tissue exposure is termed indirect pulp capping

DIAGRAM DEPICTING INDIRECT PULP CAPPING



(Ref 5, pg 180)

Indications

- The teeth when pulpaly inflammation has been judged to be minimal and complete removal of caries would cause pulp exposure.
- Mild pain associated with eating.
- Negative history of spontaneous, extreme pain.
- No mobility.
- When pulp inflammation is seen as nominal and there is a definite layer of affected dentin after removal of infected dentin.
- Normal lamina dura and PDL space.

7. No radiolucency in the bone around the apices of the roots or in the furcation.

8. Deep carious lesion, which are close to, but not involving he pulp in vital primary or young permanent teeth

Contraindications

1. Any signs of pulpal or periapical pathology.
2. Soft leathery dentin covering a very large area of the cavity, in a non restorable tooth.
3. Sharp, penetrating pulpalgia indicating acute pulpal inflammation.
4. Prolonged night pain.
5. Mobility of the tooth.
6. Discoloration of the tooth.
7. Negative reaction of electric pulp testing.
8. Definite pulp exposure.
9. Interrupted or broken lamina dura.
10. Radiolucency about the apices of the roots.

Objectives

1. The restorative material should seal completely the involved dentin from the oral .1 environment.

2. The vitality of the tooth should be preserved.

3. No prolonged post-treatment signs or symptoms of sensitivity, pain or swelling should be evident.

4. The pulp should respond favourably and tertiary dentin or reparative dentin should be formed, as evidenced by radiographic evaluation.

5. There should be no evidence of internal resorption or other pathologic changes.

6. Arresting of carious process.

7. Promoting dentin sclerosis.

8. Stimulating formation of tertiary dentin.

9. Remineralization of carious dentin.

Technique Of Indirect Pulp Capping

First appointment

Use local anesthesia and isolation with rubber dam.

↓

Establish cavity outline with high speed hand piece.

↓

Remove the superficial debris and majority of the soft necrotic dentin with slow speed hand piece using large round bur.

↓

Stop the excavation as soon as the firm resistance of sound dentin is felt.

↓

Periapical carious dentin is removed with a sharp spoon excavator.

↓

Cavity flushed with saline and dried with cotton pellet.

↓

Site is covered with calcium hydroxide.

↓

Remainder cavity is filled with reinforced ZOE cement.

Second appointment (6-8 weeks later)

Between the appointment history must be negative and temporary restoration should be intact.

↓

Take a bitewing radiograph and observe for sclerotic dentin.

↓

Carefully remove all temporary filling material.

↓

Previous remaining carious dentin will have become dried out, flaky and easily removed.

↓

The area around the potential exposure will appear whitish and may be soft; which is predentin. Do not disturb this area.

↓

The cavity preparation is washed out and dried gently.

↓

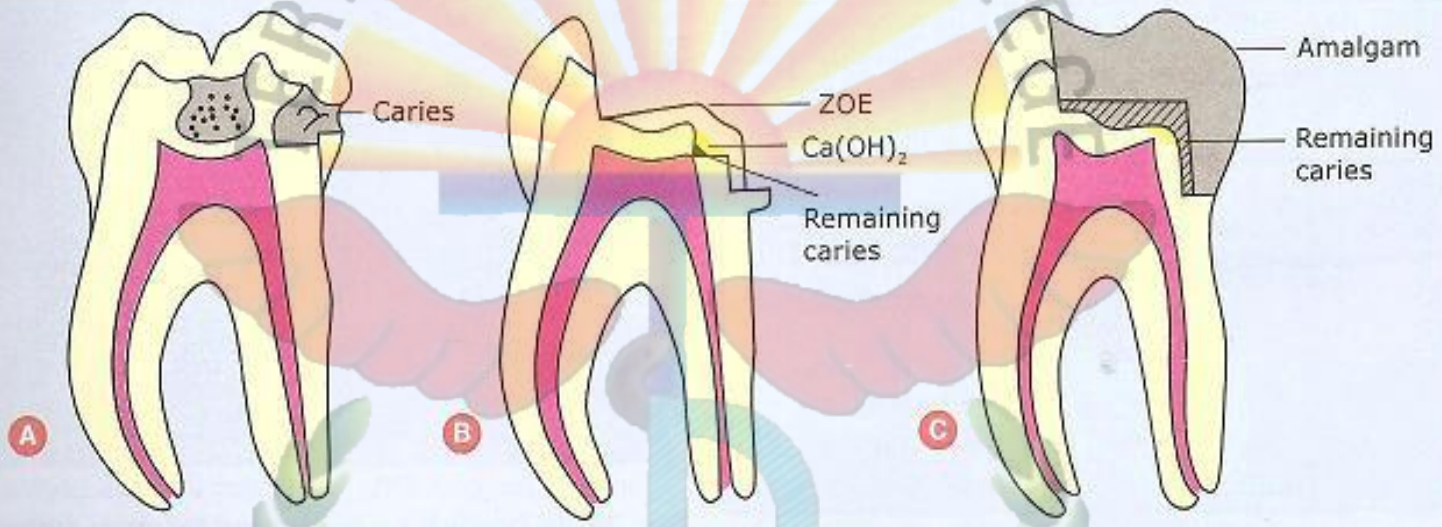
Cover the entire floor with calcium hydroxide.

↓

Base is built up with reinforced ZOE cement or GIC.

↓

Final restoration is then placed



A – The pulp will be exposed if all the caries is removed.
B – All decay is eliminated except that just overlying the pulp. Calcium hydroxide - ZOE is placed over the remaining caries.
C – The tooth is sealed with amalgam.

Indirect pulp therapy (Ref. Shobha Tandon-Pg-399)

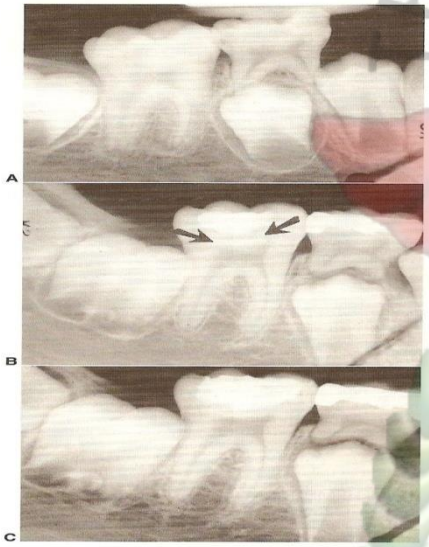


FIG. 19-7. A, Radiograph of the first permanent molar revealed a deep carious lesion. Gross caries was removed, and calcium hydroxide was placed over the remaining caries. The tooth was restored with amalgam and was not reentered for complete caries removal for 3 months. B, Sclerotic dentin can be seen beneath the remaining caries and the covering of calcium hydroxide *(arrows)*. C, The tooth was reentered, and the remaining caries was removed. A sound dentin barrier was observed at the base of the cavity. A new amalgam restoration was placed after complete caries removal.

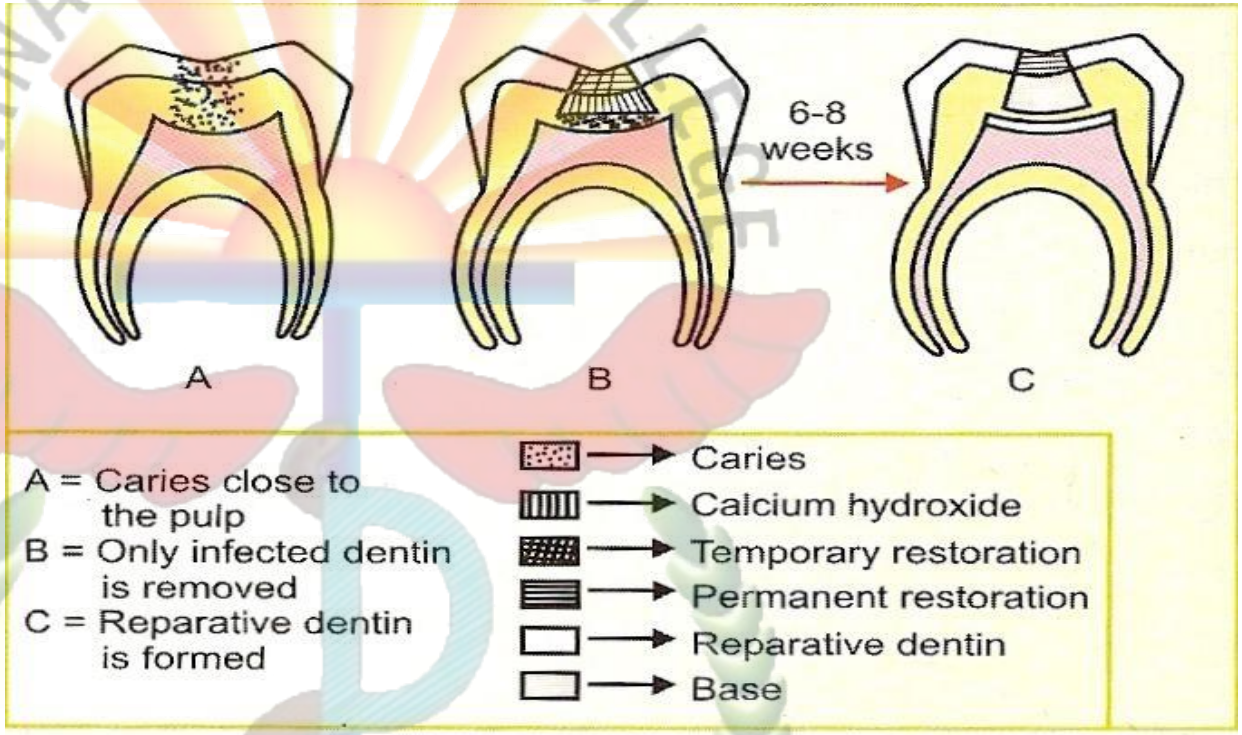
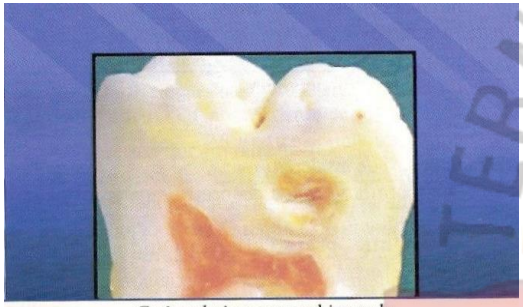


Fig. 16.1: Indirect pulp capping

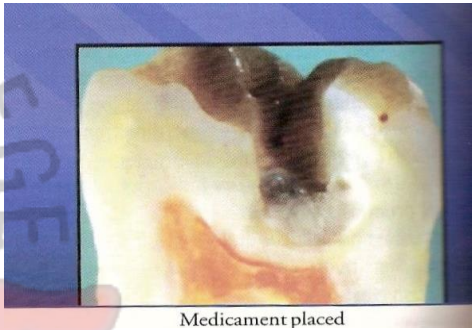


Carious lesion approaching pulp

A) CARIOUS LESION APPROACHING PULP

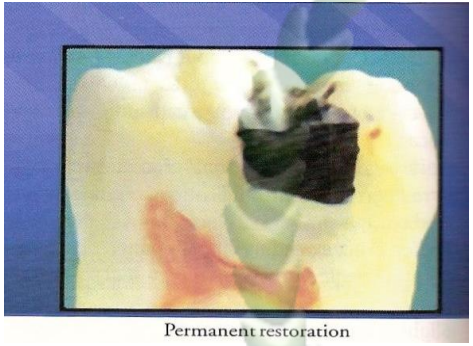
Gross caries excavation

B) GROSS CARIES EXCAVATION



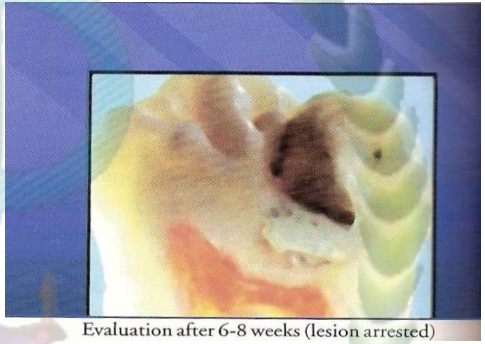
Medicament placed

C)MEDICAMENT PLACED



Permanent restoration

C)MEDICAMENT PLACED



Evaluation after 6-8 weeks (lesion arrested)

D) EVALUATION AFTER 6-8 WEEKS

Infected Vs Affected Dentin

Infected dentin	Affected dentin
▪Highly demineralized ▪Unremineralizable ▪Superficial layer ▪Lacking sensation ▪Stained by 0.5% fuschin or i.e. 1.0% acid red solution ▪**Ultrastructure**- intertubular dentin greately demineralized, with irregular scattered crystals. Presence of deteriorated collagen fibers that have only distinct cross bands and no interbands. ▪Should be excavated	▪Intermediately demineralized ▪Remineralizable ▪Deeper layer ▪Sensitive ▪Does not stain ▪**Ultrasyructure**: intertubular dentin Partially demineralized, but apatitie crystals bound like fringes to the Sound collagen fibers with distinct Cross bands and interbands. ▪Should be left remineralize.

DIRECT PULP CAPPING

Definition:

The procedure in which the small exposure of the pulp, encountered during cavity preparation or following a traumatic injury or due to caries, with a sound surrounding dentin, is dressed with an appropriate biocompatible radiopaque base in contact with the exposed pup tissue prior to placing a restoration is termed as direct pulp capping.

Indications

1. Light red bleeding from the exposure site that can be controlled by cotton pellet.

2. Traumatic exposures in a dry, clean field, which report to the dental office within 24 hours.

3. Mechanical exposures less than I sq mm, surrounded by clear dentin in an asymptomatic vital deciduous tooth.

4. Mechanical or carious exposures less than 1 sq mm in an asymptomatic vital young permanent tooth.

5. Small pulp exposures produced during cavity preparation i.e. pin point exposure surrounded by sound dentin.

6. When the tooth is not painful, with the exception of discomfort caused by food intake.

7. Minimal or no bleeding from the exposure site.

Contraindications

1. Large pulp exposures.
2. Presence of caries surrounding the exposure site.
3. Excessive bleeding indicates hyperemia or pulpal inflammation.
4. Pain at night.
5. Spontaneous pain.
6. Tooth mobility.
7. Thickening of periodontal membrane.
8. Intraradicular radiolucency.
9. Purulent or serous exudates.
10. Swelling.
11. Fistula.
12. Root resorption.
13. Pulpal calcification.

Objectives

1. The vitality of tooth should be maintained.

2. No prolonged post-treatment signs or symptoms of sensitivity, pain or swelling should be evident.

3. Pulp healing and tertiary dentin formation should result.

4. There should be no pathologic change.

5. To create new dentin in the area of the exposure and subsequent healing of pulp.

Treatment Considerations

Debridement:

Necrotic and infected dentin chips have to be removed else they will invariably be pushed into the exposed pulp during last stages of caries removal and impede healing and increase pulpal inflammation.

Therefore it is prudent to remove all peripheral caries. If exposure occurs, non irrigating solution of normal saline or anesthetic solution is used to cleanse the area and keep he pulp moist.

Hemorrhage and clotting

A blood clot formed after cessation of bleeding, impedes the pulpal healing.

Therefore care must be taken not to allow clot formation.

The clot that is formed does not allow the capping material to contact the pulp tissue directly, or the clot material itself could break down, producing degradation products that act as substrate to the bacteria.

Bacterial contamination

Adequate seal following pulp capping is a must to prevent bacterial contamination

Exposure enlargement:

The exposure site must be enlarged because:

a. It removes inflammation and infected tissue in the exposed area.

b. It facilitates washing away carious and non carious debris.

c. It allows closer contact of more capping medicament material to the actual pulp tissue.

Techniques Of Direct Pulp Capping

Rubber dam provides only means of working in a sterile environment, so it has to be used.

↓

Once an exposure is encountered, further manipulation of pulp is avoided.

↓

Cavity should be irrigated with saline, chloramines T or distilled water.

↓

Hemorrhage is arrested with light pressure from sterile cotton pellets.

↓

Place the pulp capping material, on the exposed pulp with application of minimal pressure so as to avoid forcing the material into pulp chamber.

↓

Place temporary restoration.

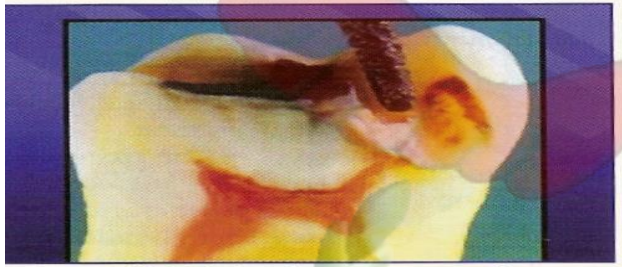
↓

Final restoration is done after determining the success pulp of capping which is done by determination of dentinal bridge, maintenance of pulp vitality, lack of pain and minimal inflammatory response.

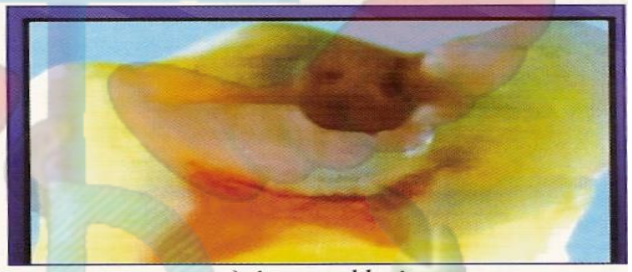
Figs 16.12A to D: Direct pulp capping; A. Pulp horns are high; B. Pulp horns exposed during cavity preparation; C. Calcium hydroxide is placed over the exposed pulp; D. Suitable base is placed over calcium hydroxide; E. Tooth is sealed with amalgam restoration

a) Minute pulp exposure

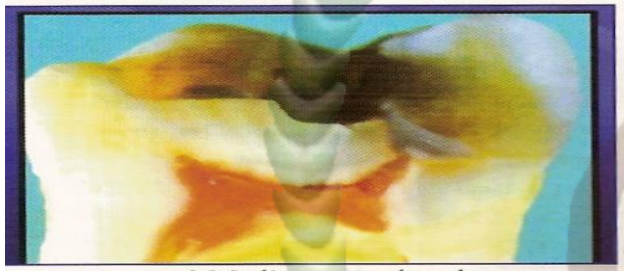
d) Evaluation after 6-8 weeks



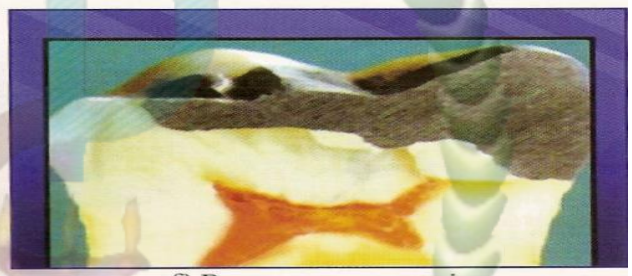
b) Peripheral caries excavated



e) Arrested lesion



c) Medicament placed



f) Permanent restoration

Histological Changes After Pulp Capping

- These were illustrated by Glass and Zander in 1949.
- **After 24 hours:** Necrotic zone adjacent to ca (oh) 2 pastes is separated from healthy pulp tissue by a deep staining basophilic layer.
- **After 7 days:** Increase in cellular and fibroblastic activity.
- **After 14 days:** Partly calcified fibrous tissue lined by odontoblastic cells is seen below the calcium protienate zone; disappearance of necrotic zone.
- **After 28 days:** Zone of new dentin

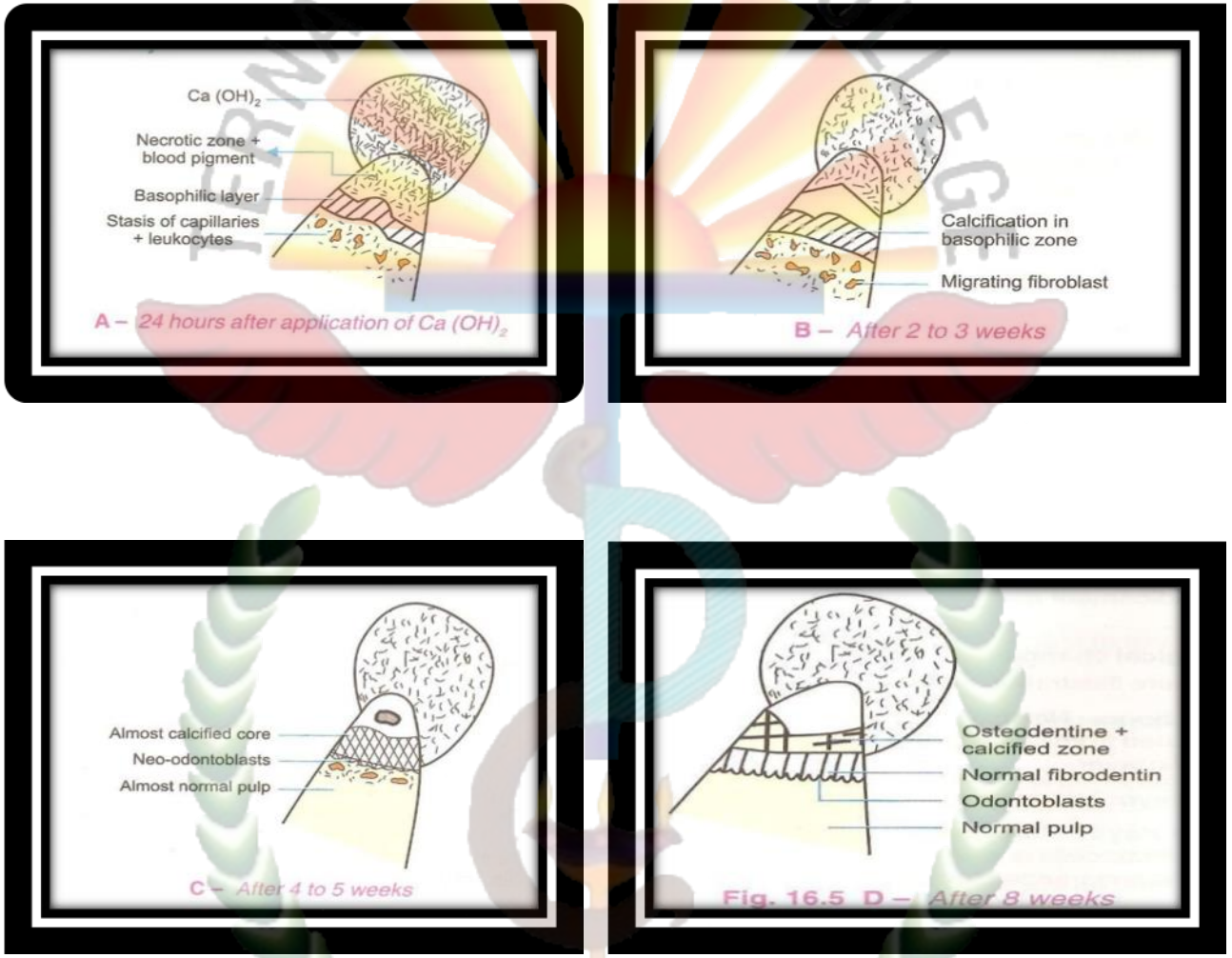

Ca (OH)2
Necrotic zone + blood pigment
Basophilic layer
Stasis of capillaries + leukocytes
A – 24 hours after application of Ca (OH)2
Calcification in basophilic zone
Migrating fibroblast
B – After 2 to 3 weeks
Almost calcified core
Neo-odontoblasts
Almost normal pulp
C – After 4 to 5 weeks
Osteodentine + calcified zone
Normal fibrodentin
Odontoblasts
Normal pulp
D – After 8 weeks

Fig. 16.5

Medications And Material Used For Pulp Capping

Calcium hydroxide

•The greatest benefit of Ca(OH)2 is the stimulation of reparative dentin bridge, due to a high alkalinity, which leads to enzyme phosphatase being activated and thus releasing of inorganic phosphate from the blood (calcium phosphate) leading to formation or dentinal bridge.

•It also has an antibacterial action.
-pulpal tissue after application

•When calcium hydroxide is applied directly to pulp tissue, there is necrosis of the adjacent pulp tissue and inflammation of the contiguous tissue.

•Compounds of similar alkalinity cause liquefaction necrosis when applied to pulp tissue.

•Internal resorption may occur after pulp exposure and capping with calcium hydroxide.

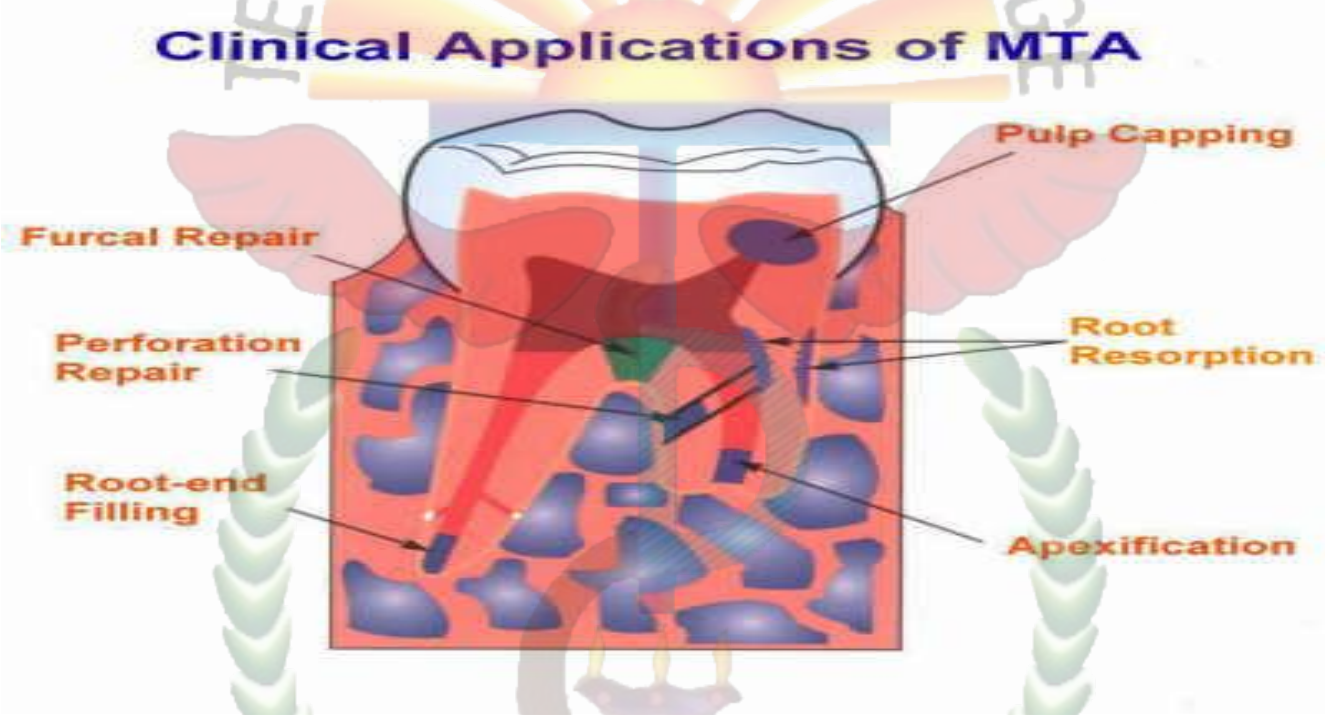
OTHER MATERIALS

- ☐Isobutyl cyanoacrylate
- ☐Denaturated albumin
- ☐Laser
- ☐Bone morphogenic protein (BMP)
- ☐MTA

MTA Advantages over Ca(OH)2

1. Thicker dentinal bridge
2. Less inflammation
3. Less hyperemia
4. Less pulpal necrosis
5. Dentin bridge formation at faster rate

Clinical Applications of MTA



Limitation Of Direct Pulp Capping In Primary Teeth

Caries process or pulp capping material may stimulate the undifferentiated mesenchymal cells that differentiate into odontoclastic cells which lead to internal resorption.

High cellular content, abundant blood supply and consequently faster inflammatory response and poor localization of infection are some of the reasons that direct pulp capping is contraindicated in primary teeth.

Calcification, chronic inflammation, necrosis and intraradicular involvement.

Conclusion

- IDPC is a favorable technique for treating primary teeth with deep caries without exposure of the reversibly inflamed pulp; it offers the advantages of lower cost, long-term higher success rate, and better exfoliation pattern.
- DPC has not been recommended for primary teeth until now. Some new biomaterials present desirable result but long-term evaluation must be considered.

Take home message

Pulp therapy for children is relatively simple and quite effective as long as the proper assessment of the situation is made, and treatment is carried out in the appropriate fashion with strict adherence to the proper technique.

Probable SAQ

1. Indirect pulp capping
2. Direct pulp capping
3. Indications and Contraindications of indirect pulp capping
4. Indications and Contraindications of direct pulp capping

Probable LAQ

1. Classify pulp therapy in pediatric dentistry. Explain indications, contraindications and clinical procedure of direct pulp capping procedure.


Thank
you