Cement Materials

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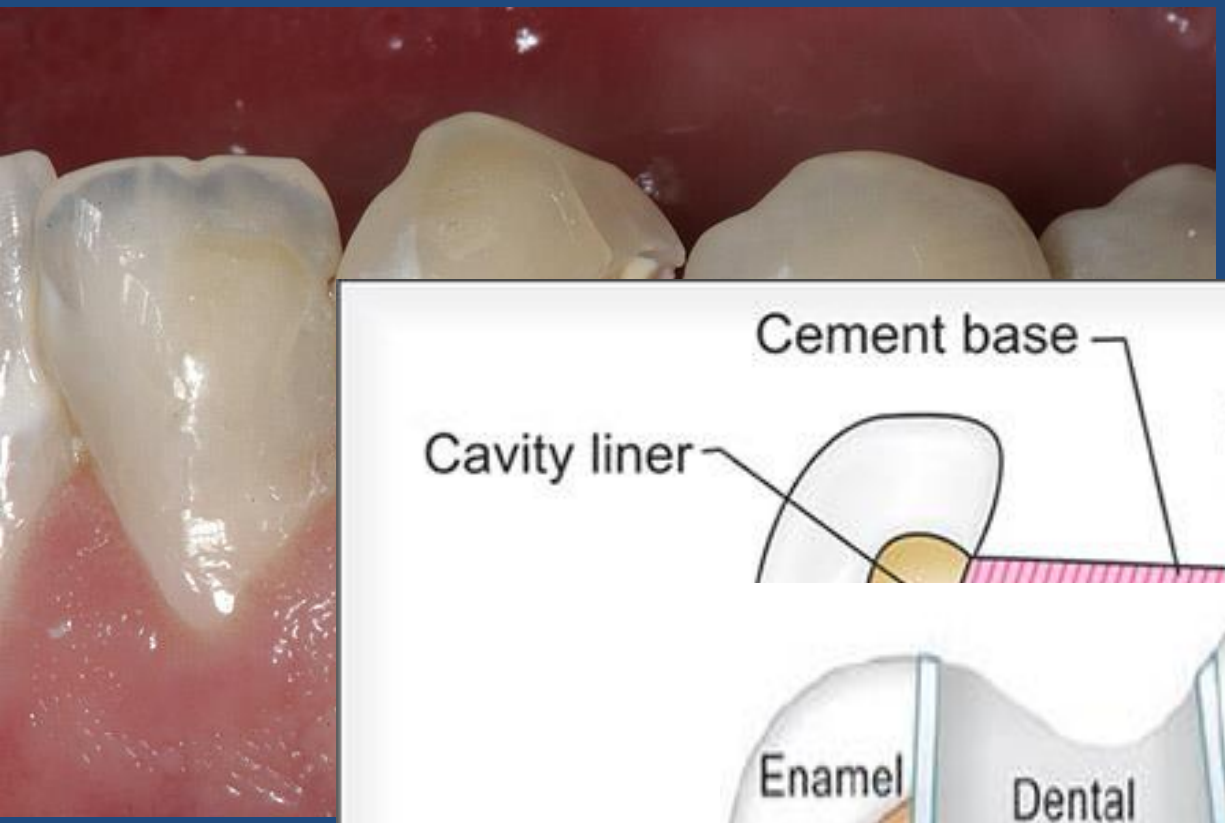
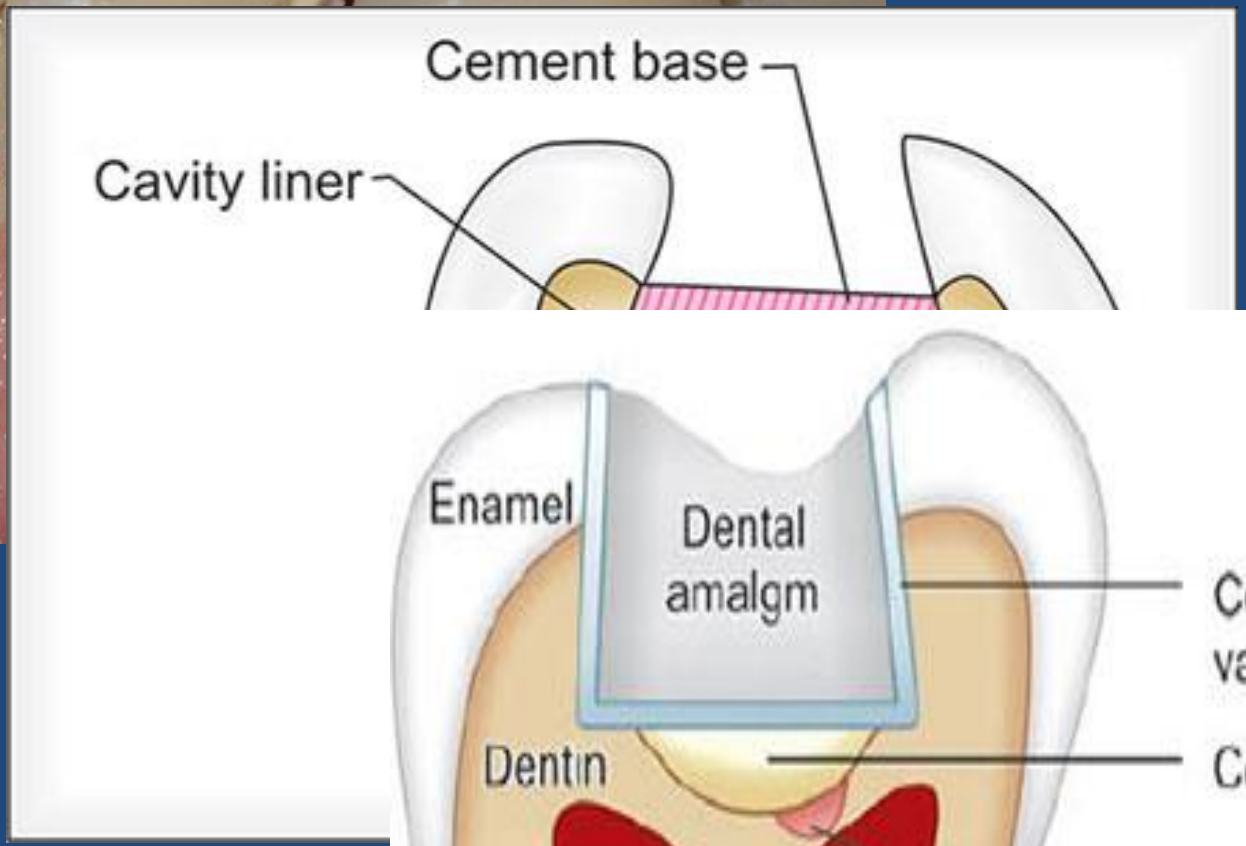
Contains….

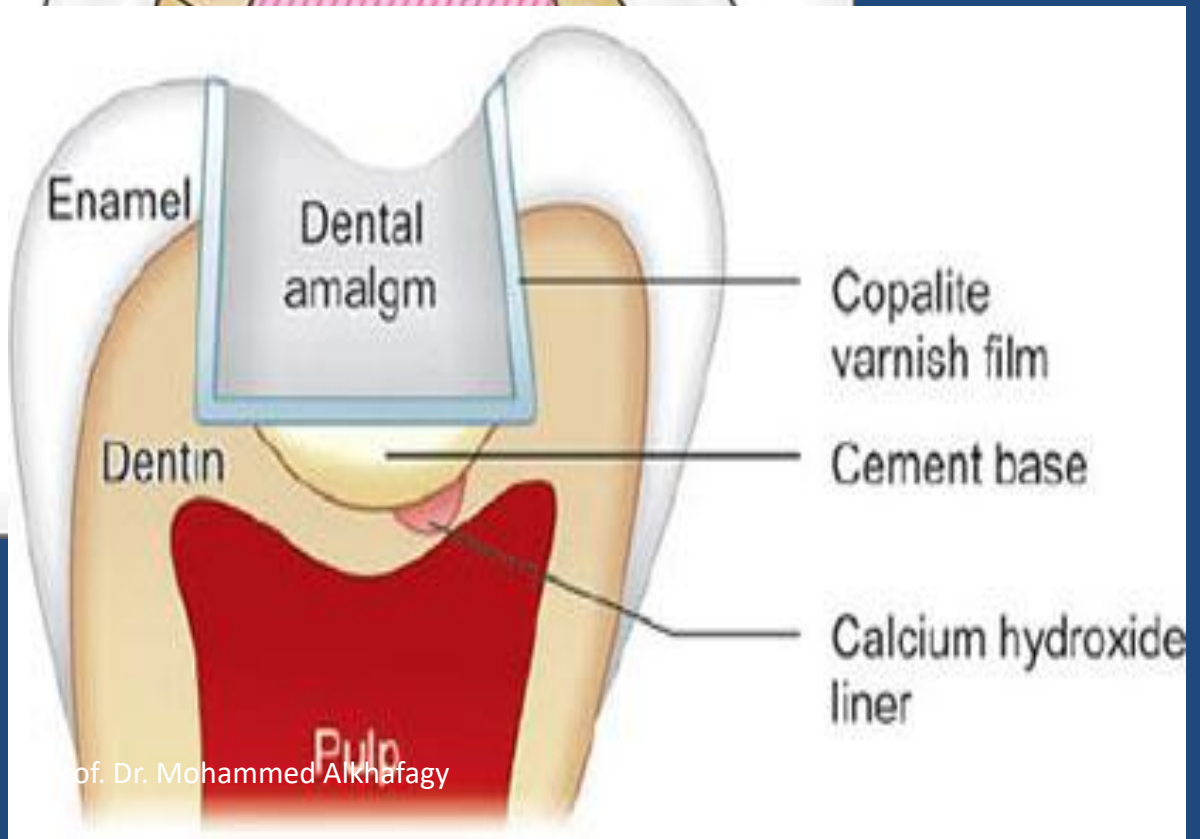
- Definition
- Uses
- Ideal properties
- Classification

Cement materials

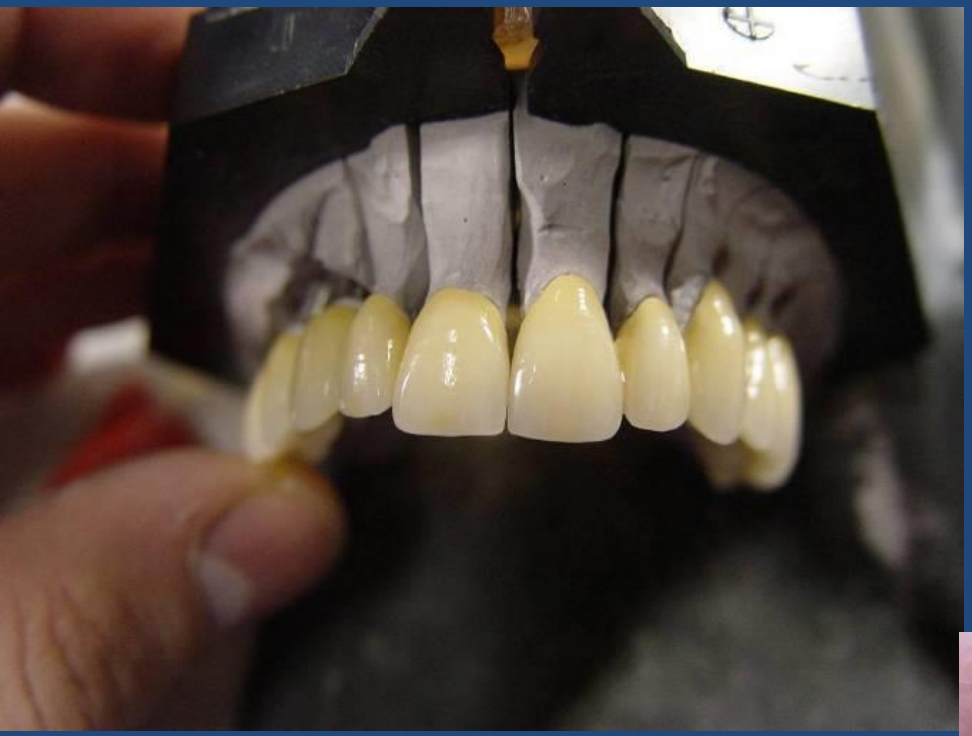
What is the differences between cement base or lining and luting cement????




Cement base
Cavity liner


Enamel
Dental amalgm
Copalite varnish film
Dentin
Cement base
Calcium hydroxide liner
Pulp

Luting cements: is a cement base used for cementation of crown and bridge restoration.



Requirements for *ideal* cement materials

1-It should have adequate strength to withstand the force applied. ***Which force?***

2-Protect the pulp from chemical irritants. ***From ???***

3-Form a protective barrier against thermal stimuli. ***From ???***

4-Protect the pulp from electrical . ***From ???***

Requirements for *ideal* cement materials

5-It should have sufficient working and setting time.

6-It should be compatible with filling material.

7-Should not irritate the pulp.

8-Should not absorbed by oral fluid especially for the luting material

Classification

I-Cement based on phosphoric acid

1-Zinc phosphate cement.

2-Silicophosphate cement.

3-Copper cement.

II-Cement based in organometallic chelate compounds.

1-Zinc oxid eugenol cement.

2-Ortho-ethoxybenzoic acid.(EBA).

3-Calcium hydroxide cement.

III-Cement based on polyalkenoic acid.

1-Zinc polycarboxylate cement.

2- Glass ionomer cement.

Zinc phosphate cement

Uses ???

1-lining materials

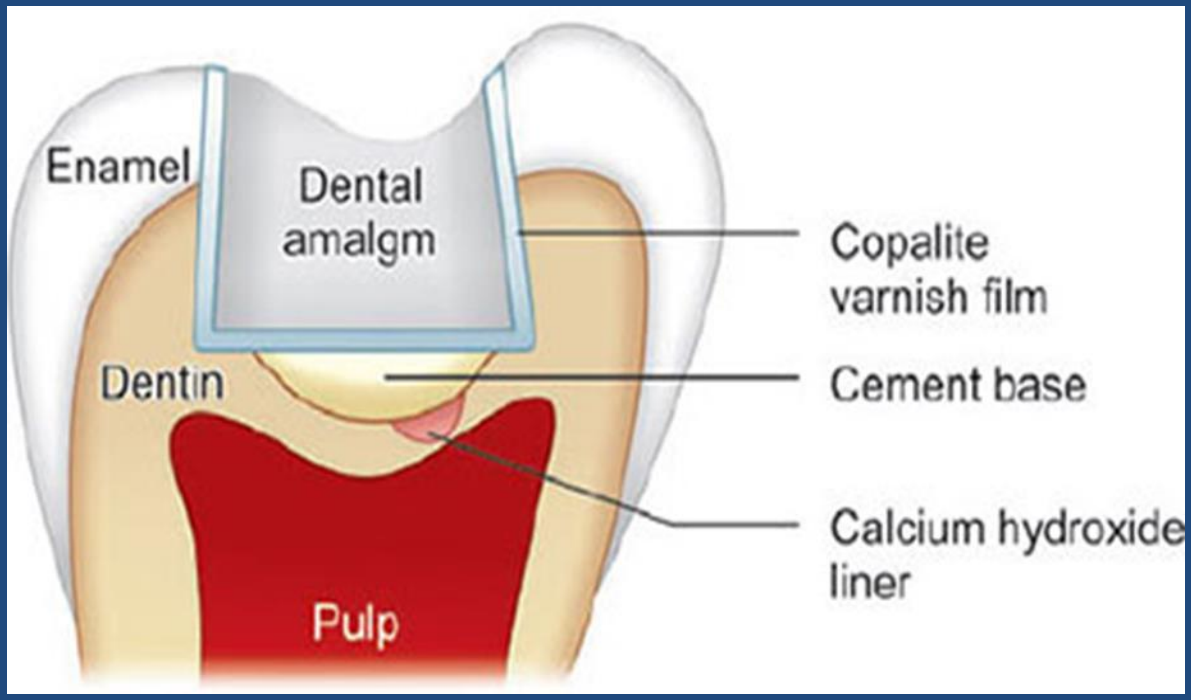
2-luting materials

3- Sometimes used as a temporary filling

Zinc phosphate cement

Properties:

4-High initial acidity especially when freshly placed this depend on the P/L ratio, so in deep cavity a ***subliner*** should be used.



Zinc phosphate cement

Manipulation

The P/L ratio is according to manufacturer instruction.

-Low P/L ---- lead to???

- ***high acidity and week mix***
- ***irritation of the pulp.***

-High P/L ----thick mix lead to???

- ***decrease setting time***
- ***insufficient working time.***

-Mixing is done on cold slab, because ??

the reaction is exothermic,

Manipulation

- Dispense the cement P/L :1.4 gm / 0.5 ml.
- Divide the powder in one corner of the glass slab into increments depending on product.
- Dispense the correct amount of liquid, to area of the slab away from the powder.
- Add the powder to liquid in portions at 15 sec intervals for a mixing time 60-120 sec

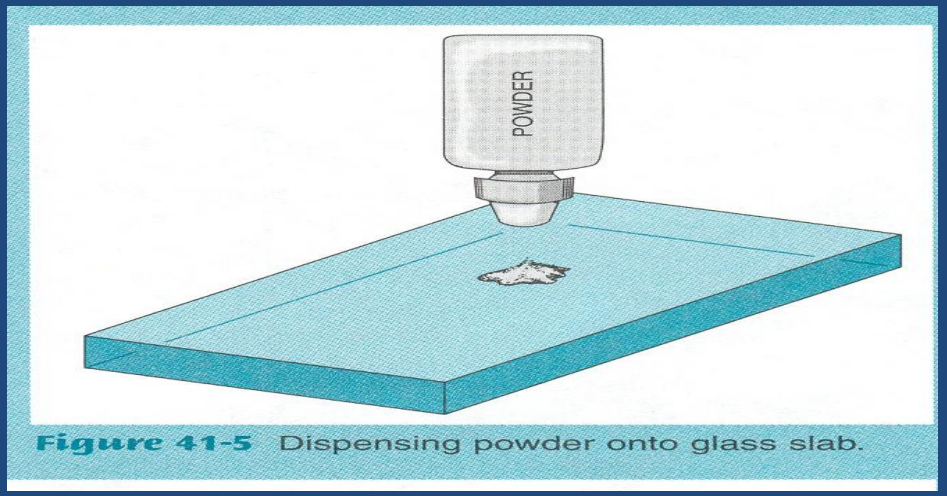


Figure 41-5 Dispensing powder onto glass slab.


Figure 41-4 Assembling of materials.

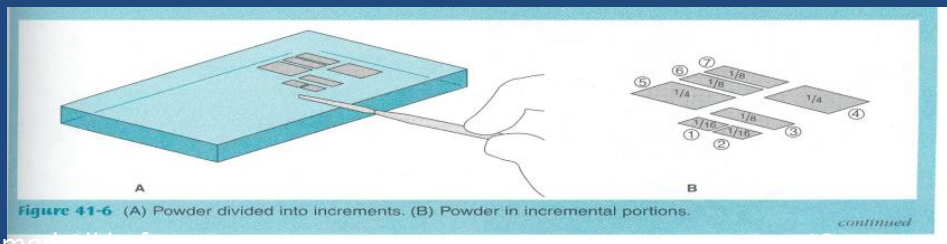


Figure 41-6 (A) Powder divided into increments. (B) Powder in incremental portions.

- Mix it over a large area of the slab with a flexible metal spatula.
- Test the consistency of the cement before adding the last portion of powder.

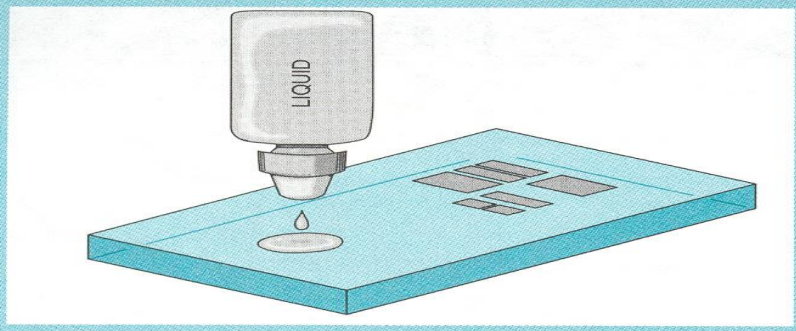


Figure 41-7 Dispensing the liquid.

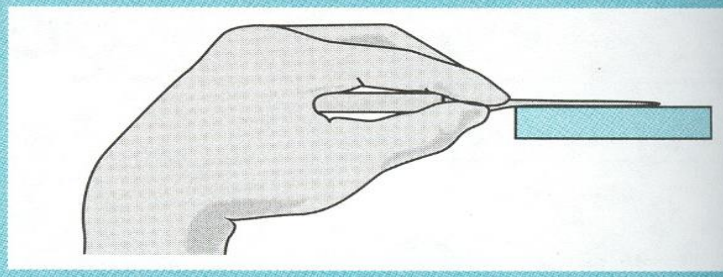


Figure 41-8 Spatula blade flat against glass slab.

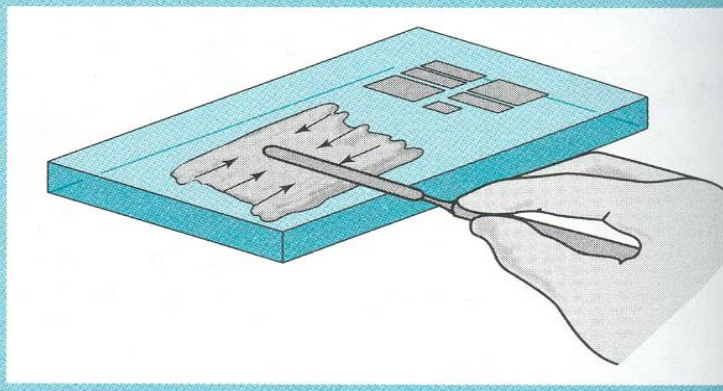


Figure 41-9 Spatulate mix over large area of glass slab.

Silicophosphate cement

-The clinical indications for this cement are similar to those of zinc phosphate cement. But its ***strength is some what superior.***

Silicophosphate cement

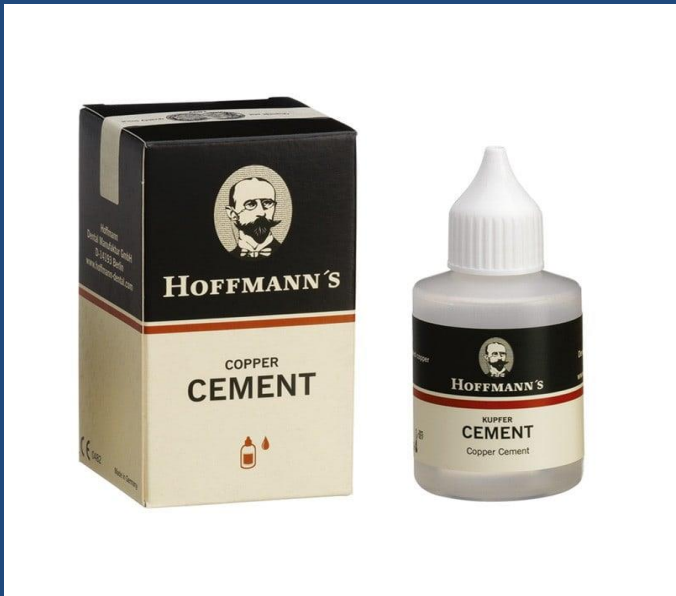
-It contains sufficient amount of fluoride. So what??

- Leaching of fluoride ion has a significant anticariogenic influence on the surrounding tooth substance.

Uses: luting cement and temporary filling material.

Copper cement:

- Disadvantage ???
- has black appearance.
- **Used in?**
- deciduous teeth.




Thank You.

Classification

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1-Zinc oxid eugenol cement.

2-Ortho-ethoxybenzoic acid.(EBA).

3-Calcium hydroxide cement.

III-Cement based on polyalkenoic acid.

1-Zinc polycarboxylate cement.

2- Glass ionomer cement.

Zinc oxide eugenol cement

Powder: zinc oxide and zinc acetate (accelerator)

Liquid: Eugenol , olive oil (control viscosity).

Zinc oxide eugenol cement

Uses:

1-Temporary filling.

Zinc oxide eugenol cement

Uses:

2-Retention of temporary crowns.

Zinc oxide eugenol cement

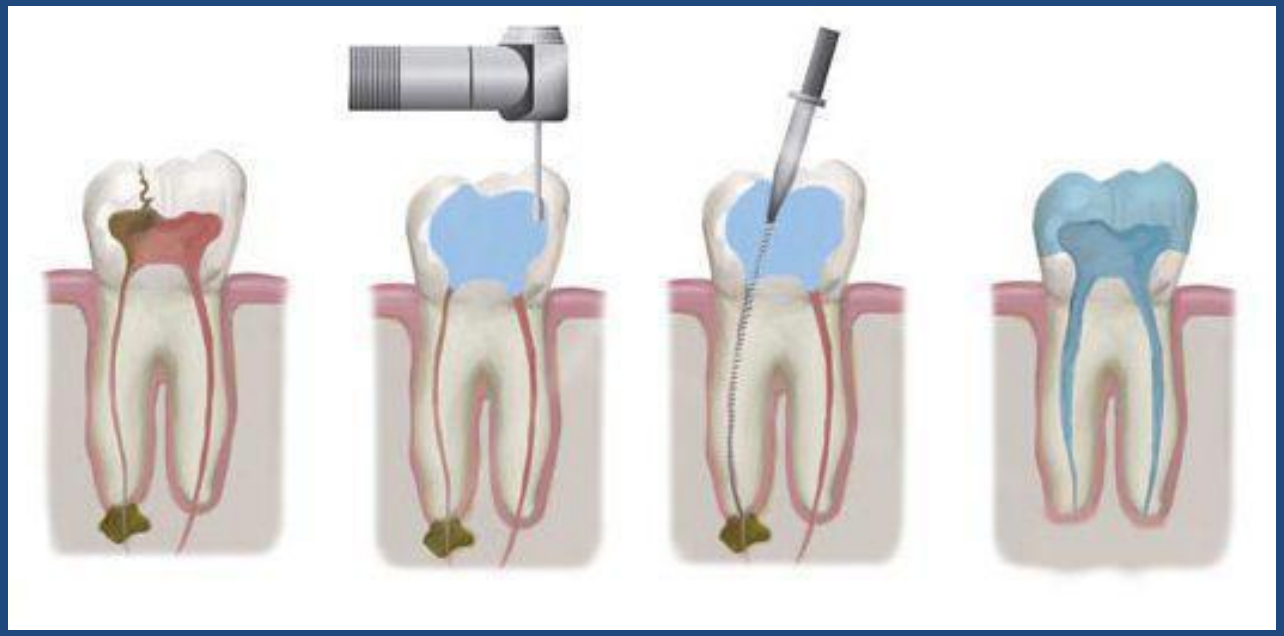
Uses:

3-Cement base especially resin reinforced zinc oxide eugenol.

Zinc oxide eugenol cement

Uses:

4-Root canal paste but has certain additives.



Zinc oxide eugenol cement

Uses:

5-Periodental dressings.

Fig 9: Flap repositioned and sutured

Fig 10: Periodontal dressing placed

Zinc oxide eugenol cement

Properties

1-Compressive strength 20MPa so not used under amalgam.

Reinforced ZOE cement has a higher strength 40MPa so can be used under amalgam.

2-Can be used in deep cavity without subliner (not irritate the pulp).

Zinc oxide eugenol cement

Properties

3-Higher solubility ***(so what???)***

so not used as a luting agent.

4-Free eugenol has an effect on resin based filling material

- *interfere with polymerization and setting time cause discoloration*
- *so not used as a lining with these types of fillings.*

5- Effective thermal barrier.

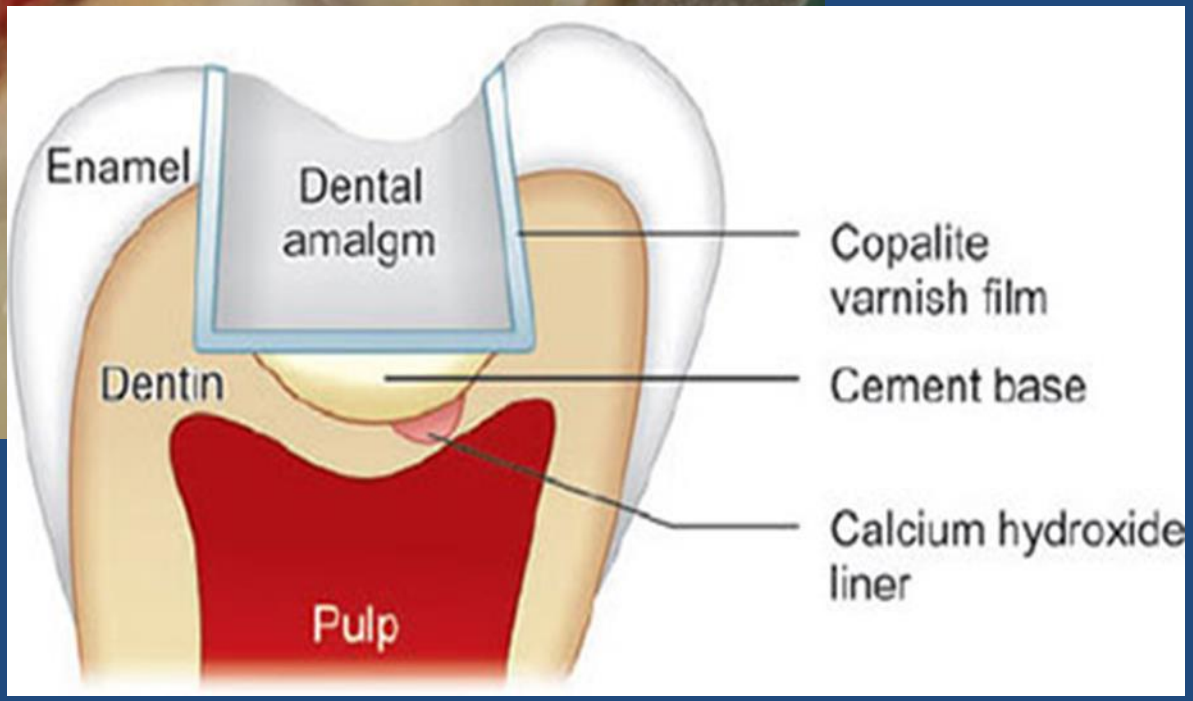
Calcium hydroxide Ca(OH)2:

Calcium hydroxide Ca(OH)2:

Indication:

As a subliner material and pulp capping.


2>


Enamel
Dental amalgm
Copalite varnish film
Dentin
Cement base
Calcium hydroxide liner
Pulp

Calcium hydroxide Ca(OH)2:

Properties

1-Set within few seconds, setting time affected by moisture .

2-Relatively week compressive strength 20MPa. *So what???*

3-High solubility in aqueous media. *So what???*

So not used as a luting agent.

Calcium hydroxide Ca(OH)2:

Properties

4-

- Sufficient biocompatibility when placed adjacent to the pulp
- capable to destroy any remaining bacteria
- able to initiate formation of secondary dentine layer at the base of the cavity
- so used in pulp capping.

5- It can be used under resin based filling material. ex: composite filling.

6- Not used as a luting agent.

Classification

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1-Zinc oxid eugenol cement.

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3-Calcium hydroxide cement.

III-Cement based on polyalkenoic acid.

1-Zinc polycarboxylate cement.

2- Glass ionomer cement.

Polycarboxylate cement:

Polycarboxylate cement:

Powder : zinc oxides and aluminum oxide.

Liquid : polyacrylic acid 40 % .

Polycarboxylate cement:

Properties

1-Ultimate compressive strength 80MPa which is sufficient to withstand force of condensation.

2- Acidic but less irritant than zinc phosphate cement. *Because……*

a- polyacrylic acid is a weaker acid than phosphoric acid

b- polyacrylic acid has a large molecules and lack mobility to penetrate dentinal tubules.

But is not used in deep cavity without subliner.

Glass ionomer cement

Glass ionomer cement

-Powder : Calcium fluoroaluminosilicate glass

-Liquid :47 % solution of 2:1 polymeric acid / itaconic acid in water

Glass ionomer cement

Uses

1- Cement base

2-Luting agent for crown and bridges.

3-Bonding of orthodontic bands.

4-Restoration of deciduous teeth.

Glass ionomer cement

Manipulation

- P/L. ratio is according to manufacturar instructions.
- Mixing on a paper pad with stiff spatula, the powder is divided into two portions; mixing time is 30-60 sec.
- The cement should be used immediately because the working time is 2 minutes.
- Working time increased when mixing is done on cold slab.

Glass ionomer cement

Properties

1-Compressive strength ranges from 60 MPa for a luting cement material and 220 MPa for filling material .

2-Adher well to the tooth substance (the free carboxyl group bonds to the hydroxyapetite of enamel and dentin) giving initial adhesion.

3-Lower solubility than zinc phosphate cement and polycarpoxylate cement.

Glass ionomer cement

Properties

4-Translucent due to the presence of unreacted glass .

5-High acidity at freshly mix, but PH increased gradually.

6-Has a sustained fluoride release.


Thank You.

Resin Cements

- Polymeric cements that set via polymerization reactions.
- Resin cements are essentially flowable composites of low viscosity.
- With the new developments in adhesive dentistry, resin luting cements have become widely used due to their ability to bond indirect restorations to the tooth structure.
- These materials can minimize some adverse effects of direct composite restorations, such as polymerization contraction stress and gap formation at the tooth/restoration interface.

Resin Cements

- Applications

➢ Cementation of:

- Crowns.
- Resin bonded bridges.
- Inlays and onlays.
- Orthodontic brackets.
- Veneers.
- Posts and Cores.

Applications of Resin Cements

Composition and Chemistry

- Similar to that of resin based composite filling material: resin matrix with silane-treated inorganic fillers.
- Fillers: silica or glass particles &/or colloidal silica used in micro-filled composites.
- Require a dentine bonding agent in most instances to promote adhesion to tooth structure e.g in luting a crown.

Polymerization

- By
- Conventional chemical cure system
- Light activation
- Dual cure.

Properties of Resin Cements:

1. Insoluble in oral fluids.
2. Monomer is a pulp irritant, thus line with $Ca(OH)_2$ or GIC if dentine thickness ≈ 0.5mm or less.
3. Compressive strength: 180-265MPa.
4. Tensile strength: 30-63MPa.
5. Viscosity: Low to high.
6. Film thickness: 13-20 μm.
7. Shear bond strength to enamel: 15-35MPa. And to dentine: 5-35MPa.

Manipulation

- Ensure clean, dry area of tooth surface.
- Condition with etchant.
- Prime.
- Bond.
- Remove excess cement immediately after prosthesis is seated.
- Light cure if indicated, usually for no less than 40 seconds.

(See **Table 1**).

Figure 4: A gingival retraction cord is placed.

Figure 5: The adjacent teeth are protected with Teflon tape.

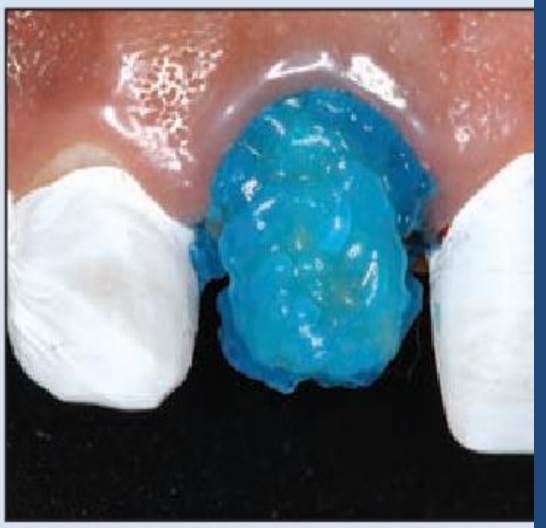

Figure 6: The tooth is etched with 37 phosphoric acid.

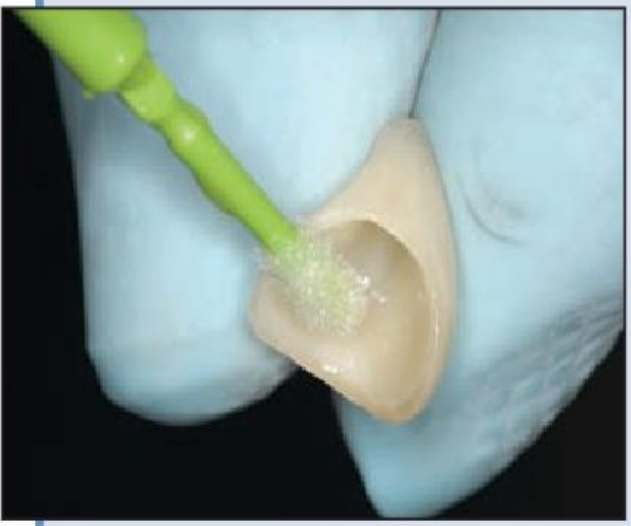

Figure 7: A resin cement is applied.

Figure 8: The gingival retraction cord is removed.

Figure 10: Final result.

Advantages

1. Only cement that is insoluble in oral fluids.
2. High strength.
3. Viscosity suitable for luting.
4. Various shades; color can be matched to the tooth.
5. Dual cure.
6. Radio-opaque.
7. Easy to manipulate.

Disadvantages

1. Disintegrates if used as a gap filler.
2. Self cured form is difficult to trim.
3. Expensive.
4. Irritation to pulp.
5. Stains.
6. Poor wear if not highly filled.

Temporary filling materials

Temporary filling materials

Indications:

1-During treatment of root canal filling.

2- Inlay and only preparation. TF should be placed after preparation until the final restoration is placed.

3-After pulp capping in case of traumatic exposure, to give time for pulp healing process and production of dentin.

4-In pedodontic treatment.

Temporary filling materials

Requirements:

1-Should be easily removed from the cavity.

2- Should have sedative effect to the tooth.

3- Reasonable strength and abrasive resistance.

4- Radiopaque.

5-Reasonable setting time and has flow after setting.

Types of temporary filling:

1-Zinc oxide eugenol ZOE

2-Zinc phosphate (ZP)

3-Zinc –silico phosphate(ZSP)

4-Gutta percha(G.P)

Zinc oxide eugenol

According to ADA specification. There are 4 types of ZOE:

Type 1:temporary cementation

Type 2:permanent cementation of the restoration.

Type 3:temporary filling.

Type 4:cavity liner (base).

It's the material of choice as temporary filling, supplied as :

Powder :zinc oxide , zinc acetate.

Liquid: olive oil, eugenol

Zinc oxide eugenol

Properties:

1-It has sedative effect on the teeth , reasonable sealing of the cavity ,but it has low strength, low abrasive resistance, low flow after setting.

Placement of ZOE should not be more than few days, maximum few weeks.

2-The strength and abrasive resistance could be improved by adding 20-40 wt% of fine polymer particles and treating the surface of zinc oxide particles with carboxylic acid(reinforced ZOE type).

3-Sufficient powder should be added to the liquid to achieve putty consistency.

Zinc phosphate cement

Properties:

1-Has higher strength and abrasive resistance than ZOE, has a relatively low solubility in oral fluids .but still has low abrasive resistance in area subjected to high load of mastication.

2-Higher powder \liquid is required for low acidity and high strength.

3-Reinforced zinc phosphate is more durable and could be used when longer time for temporary filling is required.

4-It is irritant in the deep cavities.

5-Bad adhesively to a wet cavity

Zinc silico phosphate

Powder: zinc oxide powder and silicate glass.

Liquid : phosphoric acid.

Used as TF because of fluoride presence in its composition.

Properties:

1-Has superior strength and it is more translucent than zinc phosphate.

2-Not promote healing of the pulp.

3-Used when longer time for temporary filling is required.

Gutta percha

Composition:

Natural gutta percha, Zinc oxide, wax or resin and metal salts to give radiopacity.

It is supplied by softening the G.P. on the flame and put it inside the cavity.

Disadvantages:

1-Lack the ability to seal cavity.

2-Heat lead to pain to the patient.

3-Low strength

THANK YOU