

Glass Ionomer Cement

Also known as: Man made dentine

Or, Dentine substitute

Or, Artificial dentine

A glass ionomer cement is a dental restorative material used in dentistry for dental fillings and luting cements. It is also now commonly used as an orthodontic bracket adhesive, either as a glass ionomer, or a glass ionomer-based cement.

Glass ionomer based cements are essentially hybrids of glass ionomers and another dental material, for example resin-modified glass ionomer cements and compomers or modified composites. These materials are based on the reaction of silicate glass powder.

It is one of the widely used dental cements. Because of its translucency and property of adhesion to enamel and dentine, it was initially developed for the restoration of the anterior teeth.

SUPPLY : *it is supplied in two forms*

1. Powder

2. Liquid

Powder: It is aluminosilicate glass prepared with fluoride fluxes.

Glass Ionomer

Discovered: Wilson & Kent

Year: 1972

Country: England

Liquid : It is an aqueous solution (about 50% by wt.) of polyacrylic acid or is a co-polymer of acrylic and itaconic acid. In addition to acrylic acid and itaconic acid co-polymer, it also contains small amount of tartaric acid.

Composition of

Glass Ionomer

❖ .Powder

- Silicate Oxide -----29%
- Aluminium Oxide -----16.6%
- Aluminium Phosphate -----9.9%
- Aluminium Flouride -----7.3%
- Calcium Flouride -----34.4%
- Sodium Flouride -----3%
- Others
 - Lanthanum
 - Strontium
 - Barium

❖ Liquid

- Water -----50%
- Polyacrylic Acid ----- 45%
- Itaconic Acid
- Maliec Acid ----- 05%
- Tricarboxilic Acid

Properties of Glass Ionomer

1. It adheres to the tooth structure by virtue of the polyacrylic acid in the liquid.
2. It is translucent and matches with the colour of the tooth.
3. It is biocompatible like zinc oxide-eugenol cement and so does not irritate the pulp and so does not require pulp protective agents, unless the cavity has an actual exposure.
4. It is anticariogenic and so prevents secondary caries due to the presence of fluorides in its powder.
5. Its mechanical properties are almost same as that of the zinc phosphate cement.
6. Its compressive and tensile strength is lower than the silicate cement.
7. Its hardness is less than silicate cement.
8. It is more resistant to attack by acids.
9. Like other cements, reduction of powder/liquid ratio reduces its physical properties.

TYPES:

Type-I : Luting cement

Type-II : Restoration

Type-III : Lining cement

Type-IV : Fissure sealant

Type-V : Orthodontic cement

Type-VI : Core build up

Type-IX : Restoration

USES OF GLASS IONOMER:

1. Luting cement

- Inlay, Onlay, Crown, Pins, Orthodontic band and bracket.

2. Restoration of permanent teeth

-Class-v and Class-III Cavity filling

- Root caries filling

-Abrasion and Erosion recovery

3. Restoration of Deciduous Teeth

-Class-I cavity filling

-Rampant cavity filling

4. Lining under composite and amalgam

5. Preventing Restoration

-Fissure sealant

6. Core buildup

7. Endodontic use

-Repair of root resorption

-Perforation

8. Retrograde filling

Setting

MANIPULATION AND PLACEMENT

- Mixing time should not be more than 45 seconds.
- After mixing the cement is immediately packed into the cavity when the cement has a glossy appearance.
- If placement is delayed the cement loses glossiness and becomes dull in appearance. In such cases, it should be discarded. After placement, a preformed matrix is applied immediately and is left for 5 minutes. After removal of matrix, the surface of the cement is covered by the water insoluble varnish to protect the cement from dehydration. After removal of the excess cement, the filling is again coated with varnish. Cervical erosion lesion does not require cavity preparation. The tooth structure is cleaned by rubbing a cotton pledget saturated with 50% citric acid for 30 seconds. After this, the lesion is washed with water and dried before application of the cement.

Setting reaction resembles that of silicate cement. When mixed with liquid, the glass of the powder is attacked by the acid and Al, Ca and Na ions are liberated forming Ca and Al polysalts, which cross link the poly anion chains. The salt hydrate to form a gel matrix and like silicate cement is held together in an amorphous matrix of hydrated calcium and aluminum polysalt. Setting time is 5 minutes from the start of mixing.

Mixing of Glass Ionomer:

It can be carried out by two (2) means:

- a) Mixing by hand
- b) Mechanical mixing

To get best results from silicate cements, they are to be mixed both as quickly and as thickly as possible.

a) Mixing by hand

- ❑ A thick glass slab is to be use and this should be cooled to get prolonged working time.
- ❑ The glass slab should not be cooled below dew point that is a temperature at which the water vapour present in the air saturates the air and starts to condense on the glass slab.
- ❑ The condensed moisture, during mixing of the cement, will be mixed with it and will affect the solubility and mechanical properties of the set cement.
- ❑ The glass ionomer should never be spatulated with ordinary metal or steel spatula as phosphoric acid reacts with other metala. In addition, the silicate powder is quite abrasive and particles of the metals may be rubbed during mixing and are likely to discolour the material.
- ❑ Only chrome-cobalt (satellite) spatulas or bone, ivory, plastic or agate spatulas should be used.
- ❑ Correct powder/liquid ration is very important and is 1.6 gm/0.4 ml. a liquid, in which due to water loss, crystals have formed, should be discarded.
- ❑ A mix which is too thick will produce a crumbly mass as all the powder particles longer setting time, will be more acidic and will produce a weaker set material that will become more soluble and more prone to staining.

- ❑ Required quantity of powder is to be incorporated into the required quantity movement of the spatula and it should be completed within one minute.
- ❑ Usually half of the total quantity of powder is added to the liquid at first and then continued till we get a putty like consistency of the mix. To become sure manipulation of zinc phosphate cement, may be carried out. When the mix has attained a putty like consistency, it is ready to be introduced into the cavity.

b) Mechanical Mixing

Gelatin capsules are available in which measured amount of powder is contained in one compartment and the measured amount of liquid is kept in another compartment and the two are being separated by a seal. Before mixing is carried out, the seal is broken by applying pressure to the capsule.

Advantages of mechanical mixing:

- i. There is less chance of contamination as the material is not handled after mixing.
- ii. Correct powder/liquid ratio is obtained without guess work.
- iii. Rapid mixing can be done in 10 to 15 seconds.

Disadvantage of mechanical mixing

Due to exothermic reaction, evolution of heat occurs in mechanical mixing. This accelerates the setting time and so may reduce the working time.