

Zinc Oxide Eugenol - A Multidisciplinary Approach in Dentistry

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Abstract

Zinc Oxide Eugenol (ZOE) is a material created by the combination of Zinc Oxide and Eugenol contained in oil of cloves. Acid-base reaction takes place within the mixture to form Zinc Eugenolate Chelate. The reaction is catalyzed by water and is accelerated by the presence of metal salts. ZOE can be used as a filling cement material in dentistry. Tissue tolerance to Zinc Oxide Eugenol is better as compared to other dental materials. The cement relieve pain due to reversible pulpitis because it is bacteriostatic, obtundent as well as antiseptic nature, they are well accepted by patients. The cements are good insulators and possess better sealing properties than zinc phosphate cements. Because of their poor mechanical properties, the conventional zinc oxide-eugenol cements are mainly used as temporary fixing cements. They are also used as gingival dressings, root canal sealers and also as impression materials.

Key words: Zinc Oxide Eugenol (ZOE), Cement

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Introduction

Zinc Oxide Eugenol (ZOE) finds a special in dental practice, it is everyday cement. It has anodyne, sedative effect upon oral tissue. ZOE temporary cementing material for restorations comprising in combination a putty-form base agent composition wherein 5.0 to 50.0% by weight of silicic acid are contained in an eugenol-containing base agent composition, and a putty-form setting agent composition wherein 0.5 to 15.0% by weight of an inorganic filler material which has a solubility of up to 0.2 g per 100 ml of water at 20 agent composition. Eugenol is the main component of clove oil, and is contained therein in an amount of 80% or higher. The known Zinc Oxide Eugenol cement compositions used in the present invention comprise the eugenol-containing base agent compositions and the zinc oxide-containing setting agent compositions. The base agent composition is mixed with the setting agent compositions, whereby the eugenol is chelated with the zinc oxide for setting. Known additives such as rosin, rosin derivatives, zinc acetate,

glacial acetic acid, acetic acid, vegetable oils, colouring agents, perfumes and so on may optionally be added to both base agent compositions and setting agent compositions.

Composition

Zinc Oxide Eugenol Cement is a combination:

1. A putty-form base agent composition in which 5.0 to 50.0% by weight of silicic acid having a mean particle size of 2 to 2000 millimicrons are contained in an eugenol-containing base agent composition, and
2. A putty-form setting agent composition in which 0.5 to 15.0% by weight of an inorganic filler material having a solubility of up to 0.2 g per 100 ml of water at 20 setting agent composition.

The temporary sealing and cementing materials are essential in dentistry, e.g., temporary sealing for the sedation of cavities after the elimination of dental caries, temporary cementing of temporary crowns after pier tooth preparation and temporary sealing for medicaments in endodontics. Typical examples of the known Zinc Oxide Eugenol cement compositions are given below:

- I. Zinc Oxide Eugenol Cement (of the Liquid)
 - (a) Base Agent (Liquid) Component-Clove Oil
 - (b) Setting Agent (Powder) Component-Zinc Oxide, Rosin and Zinc Acetate
- II. Zinc Oxide Eugenol Cement (of the Paste)
 - (a) Base Agent (Paste) Component-Clove Oil, Rosin and Glacial Acetic Acid or Acetic Acid
 - (b) Setting Agent (Paste) Component-Zinc Oxide and Vegetable Oils

If required, coloring matters, perfumes and so on may be used. It is often used in dentistry when the decay is very deep or very close to the nerve or pulp chamber.

Classification

The temporary sealing material is generally classified into the following three types.¹

- I. Powder: Zinc Oxide; Liquid: Eugenol (eugenol acts as a sedative, obtundent for the pulp)
- II. Temporary cement and restorations
- III. ZOE unmodified, Temp Bond
- IV. ZOE polymer-reinforced (IRM)
 - a. Temporary cement: ↓ Retention or ↑ time
 - b. Provisional/intermediate restoration

The zinc oxide eugenol cement meets all the requirements, excels in flow ability, and has suitable degrees of strength and bonding strength, it is frequently used as the temporary cementing material.²

The time needed to finish manipulation of the setting and base agents varies depending upon the skill of operators, and has a great influence upon the performance of the set product, since there is a difference in the dispersed state between both agents.³

Mixing of the cement

Carefully and slowly shake the bottle to evenly distribute the powdered contents. Place three scoops onto the mixing pad. Place four drops of the eugenol next to the powder. To mix, incorporate half of the powder into the liquid

and fold it in using the stiff side of the mixing spatula and applying heavy force to ensure an even mix. Add the remainder of the powder, folding in. The final mixture should be putty-like; it should be tacky but malleable, and stiff enough to be properly condensed when placed. Roll the mixed cement into a long roll and cut it into small pieces using the spatula.

Place the cement in the cavity

For a Class II preparation, place a wedge in the interproximal space; the wedge serves to protect the interdental papilla and keeps it from coming in contact with the cement. A matrix band may also be necessary in situations in which a significant amount of tooth structure or an entire cusp has been removed. Use the condenser to pick up a piece of the cement and place it into the prepared cavity. If the cement sticks to the instrument, place the instrument into the powder and reapply it to adequately condense the cement into the cavity. Place the cement in increments and lightly condense, until the entire cavity is filled. Smear it against the cavosurface margin, creating a seal and simultaneously developing the occlusal anatomy.

Carve the cement

Use the Hollenback carver to smooth the interproximal margin and to develop the occlusal embrasure. Use the cleoid and beaver tail carvers to develop minimal occlusal anatomy. At this time, check the patient's occlusion using articulating paper and remove any high spots if necessary. A damp cotton pellet can be used to help accelerate setting time and to smooth the surface of the cement. After the cement has partially set, remove the wedge. Use of the wedge during placement has also allowed development of a gingival interproximal space for exchange of fluid; after a few days the patient can also use floss to clean this area.

Follow Up

When the patient returns for placement of a semi-permanent restoration, a high-speed hand piece is used with lots of water to thin the IRM, which is then fractured away from the cavity walls using hand instruments. If it is not possible to place a rubber dam with the IRM in place, cut the interproximal IRM to allow

placement of the rubber dam prior to removing the rest of the temporary.

Pulp therapy for deciduous teeth

It aims to preserve the child's health and to maintain deciduous teeth where pulp tissue is affected by caries, dental trauma, or other causes in a functional state until they are replaced by permanent teeth.⁴ When the pulp has become irreversibly infected or necrotic, a root canal treatment is indicated.^{5,6} However, the complex morphology of the root canal system in deciduous teeth makes it difficult to achieve proper cleansing by mechanical instrumentation and irrigation of the canals.⁷ Zinc oxide-eugenol cement (ZOE) has long been used as a root canal filling material for deciduous teeth⁸ and in a survey conducted in 1997 it was cited as the preferred root canal filling material by 94% of the chairpersons of predoctoral/pediatric dental programs in the United States.⁹ Nevertheless, ZOE cannot be considered the ideal root canal filling material because it presents limited antimicrobial action¹⁰ and it tends to resorb at a slower rate than the roots of the deciduous teeth.^{11,12} Concerns about these shortcomings of ZOE led to a search for alternative root canal filling materials for deciduous teeth (e.g., pastes containing iodoform, calcium hydroxide, or both). So, in order to increase the chance of success of the endodontic treatment, substances with antimicrobial properties are frequently used as root canal filling materials in deciduous teeth.

Discussion

Zinc Oxide Eugenol is the most common cements used in almost every branch of dentistry. Thus rightly it is called multi-disciplinary cement. However one must consider the pros and cons of it and rightly take precautions to use it. An object of the present invention is to provide a zinc oxide eugenol cement composition comprising a putty-form setting agent and a putty-form base agent, which can easily be available by the desired amount

with the use of a spatula, and which can be so easily mixed together by anyone regardless of skillfulness and within a short period of time and assure comfortable diagnosis and treatment

activities, since any leakage problem does not arise in use and storage. According to the present invention, this object is achieved by the provision of a Zinc Oxide Eugenol cement based on the aforesaid liquid-to-powder and paste-to-paste types having improved abrasion resistance and hence high durability, in which silicic acid is added to and mixed with a base agent composition containing eugenol, and an inorganic filler material having a solubility of up to 0.2 g per 100 ml of water at 20 inorganic filler material) is added to and mixed with a setting agent composition containing zinc oxide. It is to be appreciated that, in the aforesaid liquid-to-powder type zinc oxide eugenol cement, vegetable oils and so on may be added, when making the powdery setting agent composition putty.

Conclusion

Zinc Oxide Eugenol cement finds important place in dental practice because of its several important properties, however its mechanical properties are an area of concern as a result of which it is basically confined to temporary and intermediate restoration.

Source(s) of support: Nil

Conflict of Interest: None declared

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