BG Pulse Journal USA
ISSN:1947-2536 http://www.bgpulseusa.com/index.php/bg
BG PULSE JOURNAL

COMPARATIVE CHARACTERISTICS OF TEMPORARY FILLING MATERIALS IN MODERN DENTISTRY AND CRITERIA FOR THEIR SELECTION

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doi:https://doi.org/10.5281/zenodo.23833323

Abstract: This article provides a comparative analysis of the physicochemical properties, advantages, disadvantages, and clinical efficacy of temporary filling and dressing materials used in therapeutic and endodontic dental practice. Through the use of organized tables and statistical data, the effectiveness of temporary sealing and the criteria for selecting materials for various clinical scenarios are examined in detail.
Keywords: dentistry, temporary filling, dentin paste, zinc-eugenol cement, photopolymer materials, hermetic seal, microleakage, ZOE.

1. Introduction

Temporary sealing is a critical stage in the sequential treatment of dental caries and its complications (such as pulpitis and periodontitis). Temporary filling materials serve to reliably isolate (seal) medicinal agents placed within a tooth cavity—such as devitalizing pastes, antiseptics, or calcium hydroxide-based preparations—from the influence of saliva and microorganisms, while also protecting the dental pulp and periodontal tissues from further damage.

An improperly selected or poor-quality temporary material can lead to microleakage, resulting in the washout of the therapeutic agent or the recurrence of infection. Therefore, understanding the properties of modern temporary materials and selecting them correctly is crucial for improving the quality of dental treatment.

2. Physicochemical and clinical properties of temporary materials

In dental practice, temporary materials are categorized into several groups based on their composition, setting mechanism, and durability.

Comparative characteristics of temporary restorative and luting materials

Material Groups	Composition and brands	Setting mechanism	Key advantages	Disadvantages	Permitted duration
Aqueous cements	Zinc sulfate, zinc oxide, kaolin powder	Hydration with distilled water (2–3 minutes)	Inexpensive, hypoallergenic, easily removed	Low mechanical strength; prone to crumbling	1–3 days

(artificial dentin)	Dentin powder + clove/peach oil	Under the influence of moisture and temperature in the oral cavity	Ready-to-use paste-like consistency, possesses antiseptic properties	Slow setting time (2–3 hours); at risk of being washed away during the initial hours	1–2 weeks
	Zinc oxide powder + eugenol (clove oil)	Undergoing a chemical reaction	Strong antiseptic, analgesic (sedative) effect	Interferes with composite polymerization	2–4 weeks
Oil-based dentin (dentin paste)	Single-component urethane methacrylate resins	Under the light of a photopolymerization lamp (20–40 seconds)	Provides a complete seal, elastic, can be removed in one piece	Relatively high cost	2–8 weeks
Zinc-eugenol cements (ZOE)	Zinc oxide + orthophosphoric acid	Acid-base reaction	Resistant to high pressure and mechanical stress	Difficult to remove once set	1 month or more

Analysis of Microleakage and Hermetic Sealing

The most critical functional characteristic of a temporary restorative material is its resistance to microleakage. If a gap remains around the cavity, microorganisms such as *Streptococcus mutans* and *Enterococcus faecalis*—present in saliva—can re-infect the root canals.

Clinical Significance of Hermetic Sealing:

Preventing Microbial Re-entry: During endodontic treatment, when calcium hydroxide or other antiseptic agents are placed within the root canals, the entry of *Streptococcus mutans*, *Enterococcus faecalis*, or the fungus *Candida albicans* from the external environment can negate the success of the treatment.

Preventing the Leaching of Medicaments: When devitalizing pastes (e.g., those containing paraformaldehyde) are placed in a tooth cavity, a failure in the hermetic seal can lead to the leakage of the agent into the gingiva, potentially causing necrosis of the periodontal tissues.

Protection Against Thermal and Chemical Stimuli: In cases where the dental pulp remains vital, a temporary restoration serves to insulate it from temperature fluctuations and chemical irritants.

Algorithms for Selecting Temporary Materials in Clinical Practice

In practical dentistry, the appropriate selection of a temporary material plays a decisive role in preventing complications and ensuring the integrity of the subsequent permanent restoration. The dentist must adhere to the following sequence and principles:

Compatibility with the type of permanent restoration:

Composite restorations: If the permanent restoration is to be a photopolymer composite, the use of materials containing eugenol (such as ZOE – Zinc Oxide Eugenol) is strictly prohibited. The

phenolic compounds in eugenol inhibit the free-radical polymerization of the composite; this reduces the adhesion of the permanent restoration to the tooth by 40–50% and leads to discoloration. As an alternative, photopolymer-based temporary materials (e.g., "Clip") or dentin pastes should be used.

Ease of removal of the temporary restoration:

Photopolymer-based temporary materials (such as "Clip") remain elastic after curing and can be easily removed in one piece using a dental probe or excavator, without the need for a rotary instrument (bur). This is highly advantageous, as it prevents damage to the walls of the tooth cavity and the margins of a prepared inlay/onlay.

Conclusion:

Temporary filling and luting materials are essential for ensuring successful dental treatment outcomes. Analyses and comparative data presented in the tables indicate that:

1. Photopolymer-based temporary materials (such as "Clip" and similar products) provide the highest level of marginal seal (hermeticity) and clinical convenience. 2. Although zinc-eugenol cements possess antiseptic and sedative properties, their use in conjunction with photopolymer composites is prohibited.

3. When selecting a material, the clinician must take into account the duration of treatment, the location of the cavity, and the type of permanent restoration to be used.

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