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Review Article **Dentistry**

Current Concepts and Future Trends in Dental Luting Cements: A Critical Review

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Abstract

Dental luting cements are essential materials used for the retention of indirect restorations and prevention of microleakage. Over the years, these materials have evolved from conventional non-adhesive cements to advanced adhesive resin-based systems. This review discusses the classification, properties, composition, and clinical applications of various luting cements along with their advantages and limitations, emphasizing evidence-based selection for optimal clinical outcomes [1].

Keywords: Luting cement, Zinc phosphate, Glass ionomer, Resin cement, Adhesion, Dentistry.

INTRODUCTION

Dental luting agents are materials used to bond restorations to prepared tooth surfaces by mechanical, micromechanical, or chemical means. They fill microscopic voids and create a seal, preventing microleakage and improving the longevity of restorations [2].

The success of indirect restorations depends on multiple factors; however, the choice of luting cement plays a critical role. Loss of retention is one of the most common causes of restoration failure [3].

A variety of luting materials are available, including zinc phosphate, zinc polycarboxylate, glass ionomer, and resin cements, each with distinct properties and clinical indications [4].

History of Luting Cements

The evolution of dental cements reflects advancements in restorative dentistry.

Zinc phosphate cement, introduced in 1878, is considered the oldest luting agent and has been used successfully for decades [5].

Zinc oxide eugenol cement was developed earlier and used mainly for temporary applications [6].

Zinc polycarboxylate cement was introduced in 1968 as the first adhesive cement capable of bonding to tooth structure [7].

Glass ionomer cement, developed in 1969, combined adhesion with fluoride release, improving anticariogenic properties [8]. Resin cements were introduced in the 1980s, offering superior strength and esthetics [9].

Classification of Luting Cements

Luting cements can be classified based on composition, setting reaction, and clinical use.

Based on composition, they include zinc phosphate, zinc polycarboxylate, glass ionomer, and resin cements [10]. Based on setting reaction, they are categorized into acid-base and polymerization cements [11]. Clinically, they are divided into temporary and permanent luting cements [12].

Ideal Requirements of Luting Cements

An ideal luting cement should possess the following properties:

- Biocompatibility and non-toxicity [13].
- Low solubility in oral fluids [14].
- High compressive and tensile strength [15].
- Adequate working and setting time [16].

- Thin film thickness for proper seating [17].
- Good adhesion to tooth structure [18].
- Thermal compatibility with tooth [19].
- Radiopacity and color stability [20].
- Fluoride release in certain cements provides an additional anticariogenic benefit [21].

Types of Luting Cements

Zinc Phosphate Cement

Zinc phosphate cement is one of the most widely used luting agents and serves as a gold standard for comparison [22].

It provides retention through micromechanical interlocking and exhibits high compressive strength [23].

Advantages:

- High strength
- Thin film thickness
- Long clinical success

Disadvantages:

- No chemical adhesion
- High solubility
- Initial low pH causing pulpal irritation [24].

Zinc Polycarboxylate Cement

Zinc polycarboxylate cement was the first cement to chemically bond to tooth structure through chelation with calcium ions [25].

It is more biocompatible and causes less pulpal irritation compared to zinc phosphate [26].

Advantages:

- Chemical adhesion
- Good biocompatibility

Disadvantages:

- Lower strength
- Higher solubility [27].

Glass Ionomer Cement

Glass ionomer cement combines chemical adhesion with fluoride release, making it anticariogenic [28].

It bonds chemically to enamel and dentin and has thermal properties similar to tooth structure [29].

Advantages:

- Fluoride release
- Chemical bonding
- Thermal compatibility

Disadvantages:

- Moisture sensitivity
- Lower early strength [30].

Resin-Modified Glass Ionomer Cement

These are hybrid materials developed to overcome limitations of conventional GIC [31].

They exhibit improved strength, reduced solubility, and fluoride release.

Resin Cements

Resin cements provide superior bonding through micromechanical and chemical adhesion [32].

They are widely used in esthetic restorations such as ceramic crowns and veneers.

Advantages:

- High strength
- Low solubility
- Excellent esthetics

Disadvantages:

- Technique sensitive
- Difficult excess removal [33].

Clinical Applications

Luting cements are used for:

- Cementation of crowns and bridges
- Post and core systems
- Orthodontic appliances
- Lining and base materials [34].
- Successful clinical outcomes depend on proper cement selection and technique [35].

Recent Advances

Recent advancements include:

- Self-adhesive resin cements
- Bioactive luting materials
- Nanotechnology-based cements [36].
- These innovations aim to improve bond strength, durability, and biological compatibility.

CONCLUSION

Dental luting cements are indispensable in restorative dentistry. No single cement fulfills all ideal requirements; therefore, selection must be based on clinical conditions and material properties.

Advancements in adhesive dentistry continue to improve the performance of luting agents, ensuring better long-term outcomes and patient satisfaction [37].

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