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LUTING CEMENTS IN PROSTHODONTICS

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ABSTRACT

Dentistry uses wide range of cements to retain crowns, post and fixed partial dentures to tooth structure. In recent years many luting agent cements have been introduced claiming clinically better performance then existing materials due to improved characteristics. Classes of dental cements have evolved from zinc phosphate to glass ionomers, resin modified glass ionomers, resin cements and lastly to self adhesive resin cements. Self adhesive resin cements require no bonding agent and simplify the cementation procedure.

KEYWORDS: Luting Cements, Properties, Advantages, Gic,

INTRODUCTION

The term luting means, the use of moldable substance to seal the space or to cement two components together.[1] Luting or cementation is the process by which crowns, restorations material and other devices are fixed or attached to tooth structure using an intermediate material called cement. Cements have multiple uses; besides attaching the restoration a luting agent must also seal the space between the restoration and tooth structure to prevent caries and chemical and bacterial irritation to the tooth and pulp.[2]

Luting cements are used in various indirect restoration and appliances like temporary or interim bridges or crown, laminate veneers for anterior teeth, orthodontic appliances, pins and post used for retention of restorations.[3] Luting agents commonly employed are luting cements such as

1. Zinc phosphate
2. Zinc poly carboxylate
3. Resin- based cement
4. Zinc oxide eugenol
5. Glass ionomer.

Among this zinc oxide eugenol and zinc phosphate cements are used as temporary cements for temporary crowns and bridge. Zinc polycarboxylate, glass ionomer, resin- based cement is employed for permanent cementation of prosthesis. Ceramic restorations are cemented mainly with resin- based cements.[3]

Physical and mechanical properties of luting cements[4] *with bonding agent

Cements (cements for final cementation)	Compressive strength (MPa)	Tensile strength (MPa)	Elastic modulus (GPa)	Bond strength to dentine (MPa)	Solubility in H2O (% IN 24hr)	Setting time at 37-degree C (min)	Film thickness (µm)
Adhesive resin	52-224	37-41	1.2-10.7	(11-24) *	-	-	-
Compomer	100	-	3.6	(18-24) *	Low	3	-
Composite	180-265	34-37	4.4-6.5	(18-30) *	0.13	4.5	13-20
Hybrid ionomer	85-126	13-24	2.5-7.8	10-12 (14-20) *	0.07-0.40	5.5-6.0	10-22
Glass ionomer	93-226	4.2-5.3	3.5-6.4	3-5	0.4-1.5	6-8	22-24
Zinc oxide eugenol -EBA alumina -polymer reinforced	64 37	6.9 3.8	5.4 2.7	0 0	0.08 0.02-0.04	9 7-9	25 25-35
Cements For Temporary Cementation: Zinc phosphate	96-133	3.1-4.5	9.3-13.4	0	0.2 maximum	5-9	25 maximum
Zinc polyacrylate	57-99	3.6-6.3	4.0-4.7	2.1	< 0.05	7-9	25-48
Cements For Temporary Restoration; Non-eugenol zinc oxide	2.7-4.8	0.39-0.94	_	0	_	_	_
Composite resin	25-70	_	_	0	_	_	_
Zinc oxide eugenol unmodified	2.0-14	0.32-2.1	0.22	0	_	_	_

Ideal requirements of luting cements

- Non-toxic, non-irritant to the pulp and others tissues
- Ability to bond to the tooth enamel and the dentine and to the dental ceramics and cast alloys.
- Desirable mechanical properties, particularly when bonding is by micromechanical retention.
- Low viscosity to give a low film thickness. A luting agent should have thickness in the range of 20-40 microns.
- Adequate working time for placement of restoration.[3]

Zinc phosphate cement

It is oldest luting cement and its longer clinical record of success serves as a standard by which newer cements are compared.[5]

The formulating and reacting component is powder- zinc oxide and magnesium oxide, liquid- phosphoric acid, water. The reaction type is acid -base reaction.[5]

It can be used as luting of restoration (inlays, crowns, fixed dental prosthesis), high strength bases, temporary restorations, luting of orthodontic bands and brackets.[2]

Retention: Zinc phosphate does not chemically bond to the teeth or prosthesis; its bond is simply mechanical. The cavity liner is applied for pulp protection before application of zinc phosphate will reduce retention by creating smoother surface with less interlocking.[5]

Advantages of zinc phosphate

1. Long track record with proven reliability
2. Good compressive strength

Disadvantages of zinc phosphate

1. No chemical adhesion. Not indicated if retention is poor.
2. No anticariogenic property
3. Pulp irritation
4. Poor esthetics.[2]

Zinc polycarboxylate cement

It was the first cement to exhibit chemical bonding to the tooth. It was not used for restorative purposes because cement is opaque.[5] It is the first polycarboxylate cement by substituting the phosphoric acid of zinc phosphate with polyacrylic acid.[2]

The formulating and reacting component is powder-zinc oxide and magnesium oxide and liquid- polyacrylic acid, water while reaction type is acid base reaction.[5]

It can be applied as luting permanent restorations, bases and liners.[2]

Factors affecting the bond

1. The clean dry tooth improves the bond.
2. If the inside surface metal crown is not clean the cement cannot bond.
3. Presence of saliva reduces bond strength.
4. Does not adhere to gold and porcelain
5. The adhesion is better to the smooth surface than to rough surface, unlike zinc phosphate.
6. Adhesion to stainless steel is excellent.[2]

Advantages of zinc polycarboxylate

- Chemically less irritant to the pulp
- Chemically bond to the tooth

Disadvantages
- ✓ Limited fluoride release compared to GIC.

Zinc Oxide Eugenolcement
ZOE cement is commonly used for luting and intermediate restorations because of its medicament quality and neutral pH. But they are the cements with low strength. They are the least irritating dental cement and have the obtundent (sedative) effect to the exposed dentin.

The formulating and reactive component is powder- zinc oxide and liquid- eugenol. The reaction type is acid- base reaction.

To improve the strength modified zinc oxide eugenol is used e.g; EBA- alumina modified and polymer-reinforced zinc oxide eugenol. Non-zinc oxide eugenol is also available. Factors affecting setting time:[5]
- ✓ **Manufacture:** The most active zincoxide powder are those formed from zinc salts like zinc hydroxide and zinc carbonate by heating at 3000^0 C.
- ✓ **Particle size:** Smaller zinc oxide particles set faster
- ✓ **Accelerators:** Alcohol, glacial acetic acid and water
- ✓ **Heat:** Cooling the glass slab, slows the reaction
- ✓ **Retarders:** It can be retarded with glycol and glycerine
- ✓ **Powder to liquid ratio:** Higher the ratio faster the set.[2]

Glass ionomer cements
Glass ionomer cements are adhesive tooth coloured anticariogenic restorative materials which are originally used for restorations of eroded areas.it is also known as biomimetic material because of its mechanical properties to dentine.

The formulating and reacting components are powder- Fluoroaluminosilicate glass and liquid- polyacrylic acid, polyprotic carboxylic acid and water. The reaction type is acid base reaction.[6]

The GICs are classified into 3 types
- **Type 1:** luting crowns, bridges and orthodontic brackets
- **Type 2a:** esthetics restorative cement
- **Type 2b:** reinforced restorative cement
- **Type 3:** lining cements, base.[5]

Resin modified glass ionomer cement
These are relatively new materials having various names like compomer, resin-ionomers, RMGI(resin modified glass ionomer), light cured GIC, dual core GIC, hybrid ionomers, etc. these materials were developed to come over some of the drawbacks of conventional GIC like
1) Moisture sensitivity.[9]
2) Low initial strength
3) Fixed working times

Indications
- Luting agents
- Cavity liner or base
- Core build up material
- Provisional restorative material

Composition
It contains components of both resin and glass ionomer. The powder consists of ion leachable glasses (silica, alumina), photo initiators or chemical initiator or both, polymerizable resin. The liquid consists of polyacrylic acid, water, methacrylate monomer, hydroxyethyl methacrylate monomers.

CONCLUSION

Over time luting cements have evolved in to stronger dental materials that are easier to use and can bond to tooth structure as well as the restorative materials perhaps most versatile cements are the resin and self adhesive resin cements. Since there are the indicated for wide variety of uses both provide bonding to tooth structure and while self adhesive cements. Offer extraordinary convenience, they should not be consider a substitute for traditional bonding cements in all situations.

REFERENCES

1. Satish Chandra, Shaleen Chandra, Ratish Chandra Jaypee -A text book of dental materials with multiple choice questions, 11.
2. John J.Manappallil 3rd edition basic dental materials ch-5:35, Ch-7:49; ch-7:53, 54, 7:68; 7: 77.
3. Synopsis of dental materials- S. Gowri Shankar section 7- dental cements, 7: 353.
4. Referred from textbook of dental materials - Sharmila Hussain revision section, 427.
5. Phillips science of dental materials Kenneth J. Anusavice, Chiayi Shen, H. RalphRawls, 14:316, 14:310, 14:318, 14:321, 14:320.
6. Davidson CL Mjor IA editor: advances in Glass Ionomer Cement Chicago, Quintessence, 1999.
7. Chaar MS, Att W, StrubJR: Prosthetic outcome of cement-retained implant-supported fixed dental restorations.
8. AJ Mueninghoff L: calcium phosphate cement: review of mechanical and biological properties.
9. Dental Materials properties and manipulation seventh edition- Craig, Powers, Watah.
10. AJ, Mueninghoff L: Calcium Phosphate cement: review of mechanical and biological properties.