

Semmelweis University Faculty of Dentistry
Department of Prosthodontics

DENTAL CEMENTS

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associate professor

Dental Cements

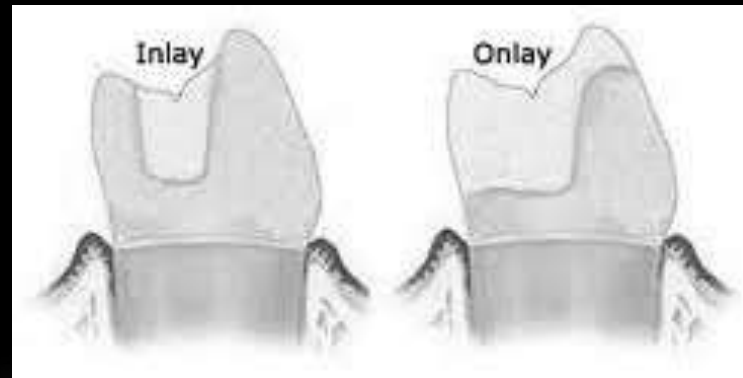
Definition:

A material that acts as an adhesive to hold together the casting to the tooth structure.

Luting agents are designed to be either permanent or temporary

Inlay is an indirect restoration consisting of a solid substance (as gold, porcelain or a cured composite resin) fitted to a cavity in a tooth and cemented into place.

Onlay is the same as an inlay, except that it extends to replace a cusp.



DENTAL CEMENTS: CROWN

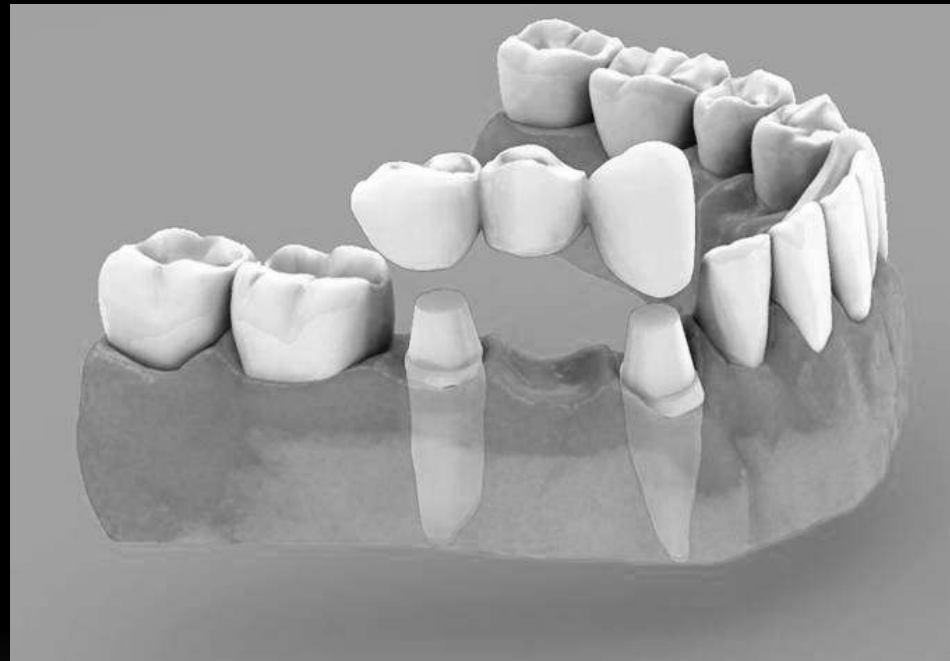
RESTORE/COVER ALL SURFACE OF THE CLINICAL CROWN OF THE PREPARED TOOTH



DENTAL CEMENTS: BRIDGE IS A FIXED DENTAL RESTORATION
USED TO REPLACE A MISSING TOOTH BY JOINING AN ARTIFICIAL TOOTH PERMANENTLY TO
ADJACENT TEETH

Parts:

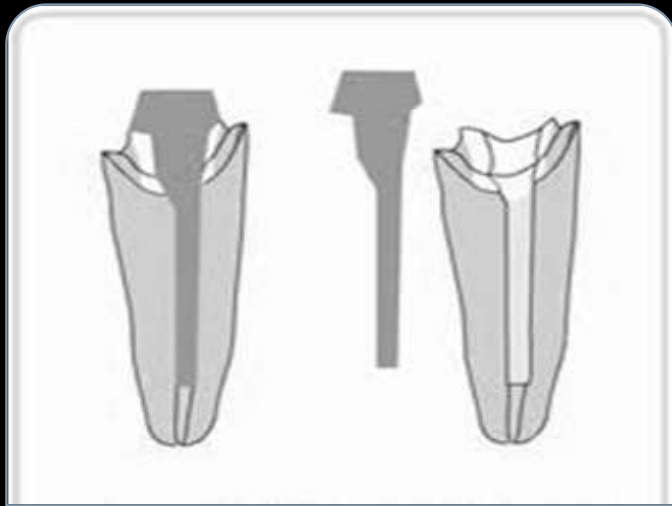
Abutment
Retainer
Pontic



DENTAL CEMENTS: POST

MADE OF METAL OR FIBER REINFORCED

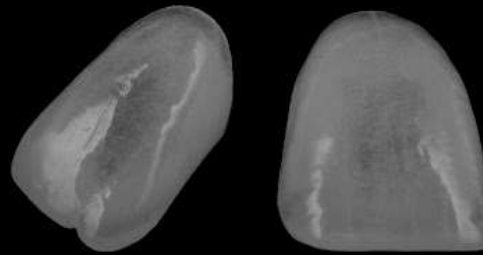
COMPOSITE MATERIAL THAT IS FITTED INTO A PREPARED ROOT CANAL OF A TOOTH THAT HAS HAD ENDODONTIC THERAPY



DENTAL CEMENTS: VENEERS

ARE COVERED THE LABIAL

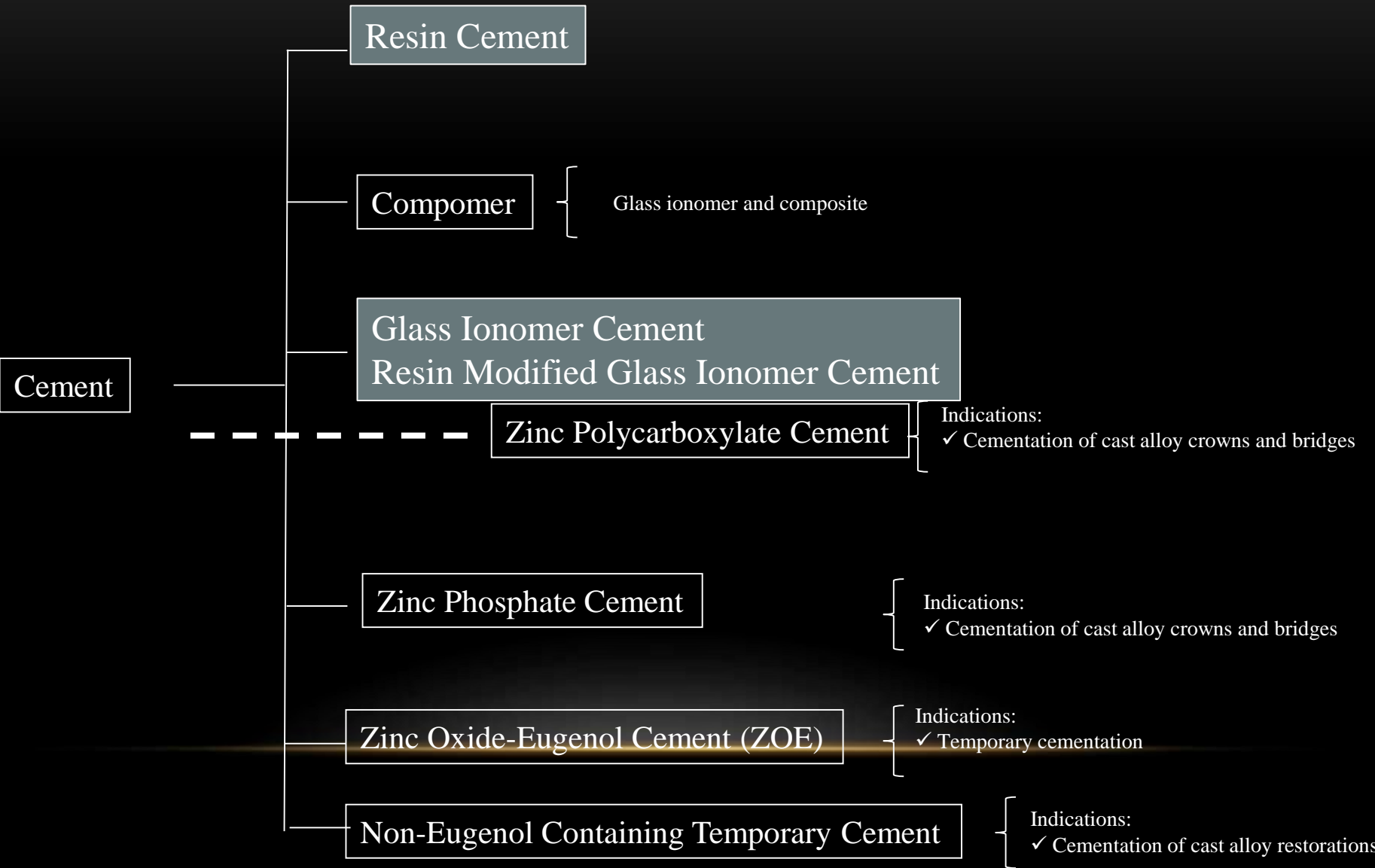
SURFACE OF THE TOOTH. THEY ARE MADE FROM EASTHETIC, TOOTH-COLORED MATERIAL.



Hant-Szabolcs ftn.

Porcelain laminate veneer

Classification of cements



DENTAL CEMENTS

- They are materials that set intraorally and that are commonly used to join a tooth and a restoration. Dental cements are a classification of dental materials that are continually used in dentistry. The American Dental Association and the International Standards Organization (ISO) have teamed up to classify dental cements according to their properties and their intended uses in dentistry.

The classification of dental cements:

Type I: Luting agents that include permanent and temporary cements

Type I/I : Fine grain for cementation and luting –

Type I/II : Medium grain for bases, orthodontic purposes

Type II: Restorative applications

Type III: Liner or base applications.

PROPERTIES OF DENTAL CEMENTS I.:

PHYSICAL PROPERTIES

- Film thickness
- Coefficient of thermal expansion
- Thermal conductivity

PROPERTIES OF DENTAL CEMENTS II.:

MECHANICAL PROPERTIES

- Tensile strength
 - Compressive strength
 - Shear strength
 - Bond strength
-

PROPERTIES OF DENTAL CEMENTS III.:

CHEMICAL PROPERTIES

- Solubility and disintegration
- Absorption

PROPERTIES OF DENTAL CEMENTS IV.:

BIOLOGICAL PROPERTIES

- Chemical irritation of pulp during setting
- pH

1. Permanent cement - for the long-term cementation

2. Temporary cement - are used when the restoration will have to be removed, temporary cement is selected for the placement of provisional restorations



PERMANENT CEMENT: ZINC PHOSPHATE CEMENT

- First cement appearing in literature
- Permanent cement for indirect restorations including inlays, onlays, crowns, and bridges
- Orthodontic cement
- High-strength base



Zinc Phosphate Cement : Composition

Powder

Zinc Oxide	> 75 %	Main Constituents
Magnesium Oxide	13 %	Aids in sintering
Barium oxides	0.2 %	Radioopacity
Other oxides (Bismuth trioxide, Calcium oxide)	1.4 %	Smoothness of mix and fillers

Liquid

Phosphoric Acid	38 % – 59 %	Reacts with ZnO
Water	30% to 55%	Controls the rate of reaction
Alumuminium Phosphate	2% to 3%	Buffer
Zinc phosphate	(up to 10%)	

SETTING REACTION

- Mixing Time : 1.5 – 2 min
- Setting Time : 2.5 – 8 min
- Exothermic Reaction



PERMANENT CEMENT: ZINC POLYCARBOXYLATE

- First dental cement to exhibit chemical bonding to teeth.
- Permanent cement for crowns, bridges, inlays, and onlays
- Orthodontic cementation



Zinc Polycarboxylate Cement : Composition

Powder

Zinc Oxide	89 %	Main Constituents
Magnesium Oxide	9 %	Aids in sintering
Barium oxides	0.2 %	Radioopacity
Other oxides (Bismuth trioxide, Calcium oxide)	1.4 %	Smoothness of mix and fillers

Liquid

Polyacrylic acid or a copolymer of acrylic acid	32 % – 48 %	Reacts with ZnO
Other carboxylic acids, such as itaconic acid or maleic acid	30% to 55%	Controls the rate of reaction
Stannous fluoride	-	adjust the setting time & increase the strength

SETTING AND PROPERTIES:

- Mixing Time : 30 seconds – 2 min
- Setting Time : 6 to 9 min
- pH : rapidly rises from 3 to 6
- Pulpal response : mild
- Solubility = 0.6 % - more soluble than zinc phosphate
- Thermal insulator - good
- Adhesion properties – mechanical & chemical (carboxyl group of tooth structure)
- Colour: opaque
- Anticariogenic properties – less as compared to GIC.

PERMANENT CEMENT: GLASS IONOMER CEMENT (GIC)

- developed in the 1970s
- tooth colored, anticariogenic restorative materials
- combined properties of silicate cements and poly carboxylate cements



CLASSIFICATION

Type I: Luting crowns, bridges, and orthodontic brackets

Type IIa: Esthetic restorative cements

Type IIb: Reinforced restorative cements

Type III: Lining cements, base



Glass Ionomer Cement : Composition

Powder

Silica (SiO ₂)	41.9	
Alumina (Al ₂ O ₃)	28.6	
Aluminium flouride (AlF ₃)	1.6	
Calcium flouride (CaF ₂)	15.7	
Sodium flouride (NaF)	9.3	
Aluminium phosphate (AlPO ₄)	3.8	
Barium/strontium oxide		radiopacity

Liquid

Polyacrylic acid or a copolymer of acrylic acid	40-50 %	Reacts with SiO and Al ₂ O ₃
Other carboxylic acids, such as itaconic acid or maleic acid	30% to 55%	Controls the rate of reaction
Tartaric acid		rate-controlling additive

PROPERTIES:

- Setting Time
 - Type I — 4-5 minutes
 - Type II — 7 minutes
- Release of fluoride
- Greater pulpal reaction than ZOE cement but less than zinc phosphate cement

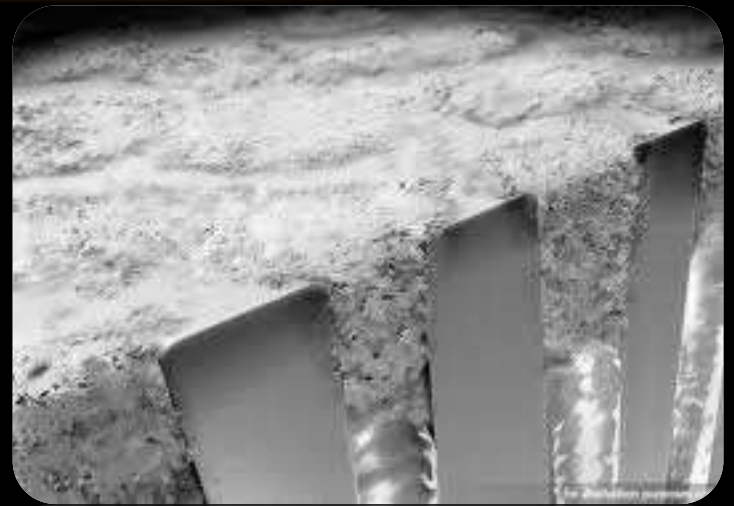
Modification of GIC:

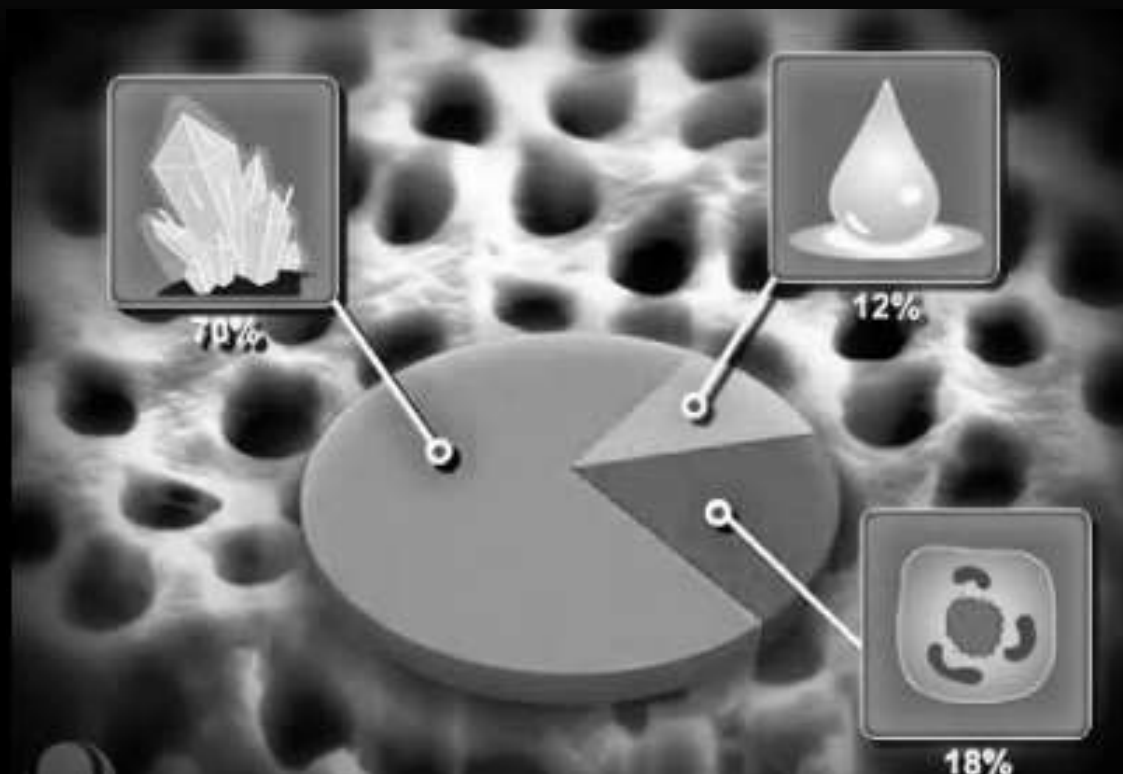
- Metal-reinforced GIC
- High-viscosity GIC
- Resin-modified GIC (hybrid ionomer)
- Calcium aluminate GIC
- Compomer

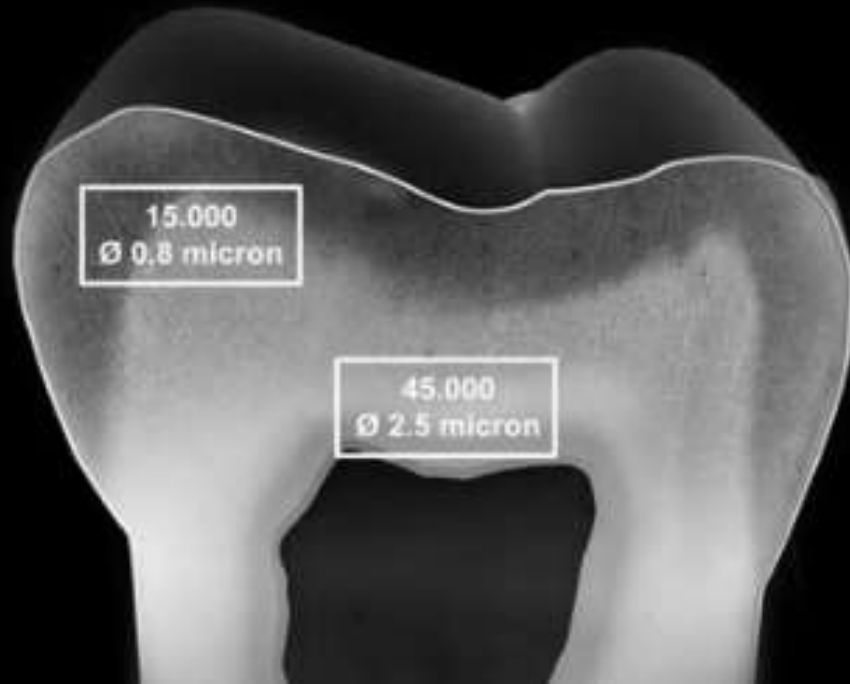


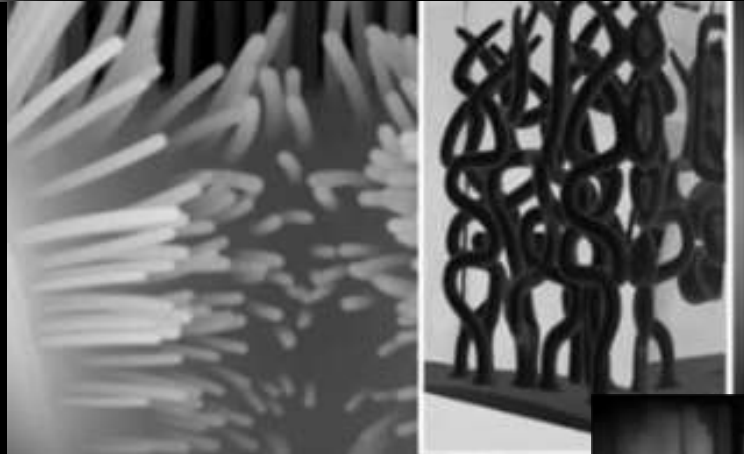
ADHESIVE CEMENTS

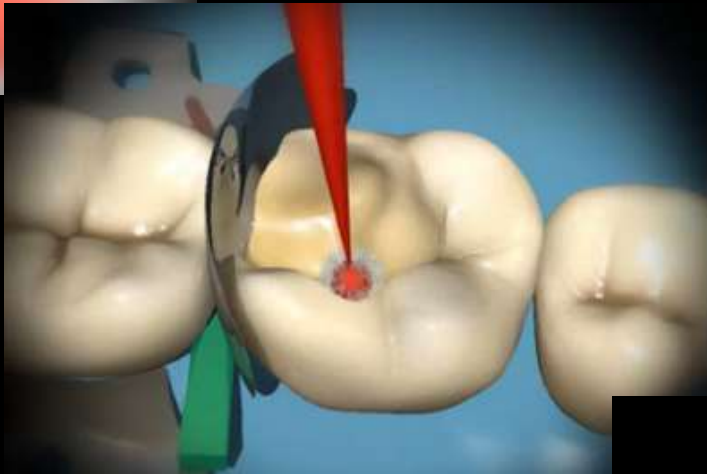
ADHESIVES:











I. DENTAL CEMENTS:

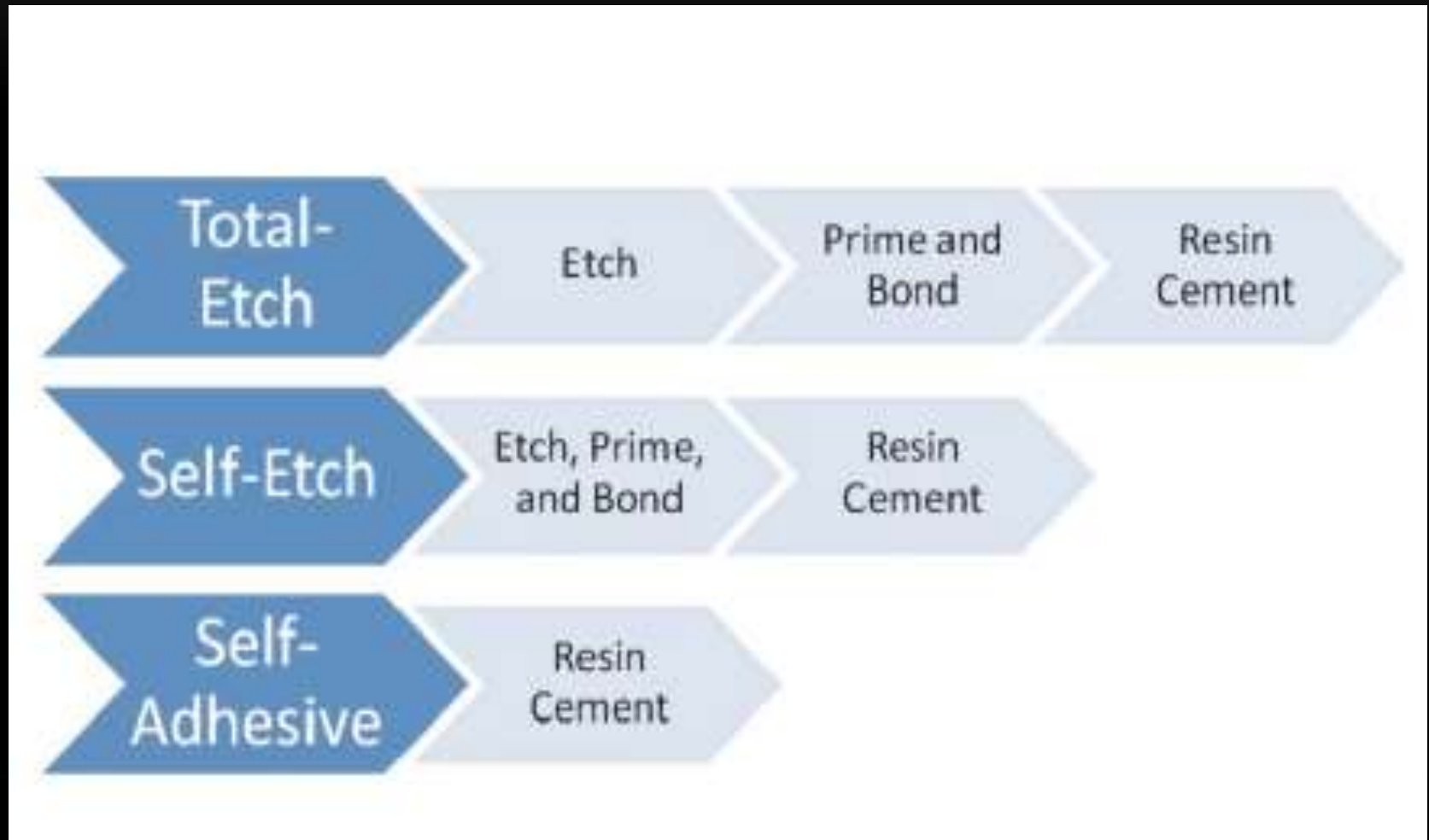
Physical bonding

Chemical bonding

Adhesive cement –
micromechanical bonding

	Cement	Film thickness (µm)	Compressive strength (MPa)	Tensile strength (MPa)
PHYSICAL	Zinc phosphate cement	25-35	96-133	3-5
CHEMICAL	Glass-ionomer	11-35	93-226	43
MICROMECHANICAL BONDING	Self-curing resin cement	25-50	292	62
	Light-curing resin cement	5-10	345-400	75
	Dual cement	16	279	48

ADHESIVE CEMENTS I.:



ADHESIVE CEMENTS II.:

<1,5 mm

- Light-curing

- Self-curing

- Dual-curing

TEMPORARY CEMENTS:

- Used for luting and intermediate restorations because of its medicament quality and neutral pH.
- Cements of low strength
- To improve the strength many modification have been introduced
- Two main types:

I. Eugenol containing:

- Formulated as a powder-liquid or two-paste system
- Powder or Base Paste: zinc oxide particles
- Liquid or Accelerator Paste: eugenol
- Slow but proceeds more rapidly in a warm, humid environment
- Best suited for provisional applications
- Residual free eugenol interferes with the proper setting of resin-based composites or resin cements.



TEMPORARY CEMENTS

II. Non-eugenol containing:

Various types of carboxylic acids have been used to replace eugenol and produce a ZOE-like material.

EBA-ALUMINA MODIFIED CEMENTS

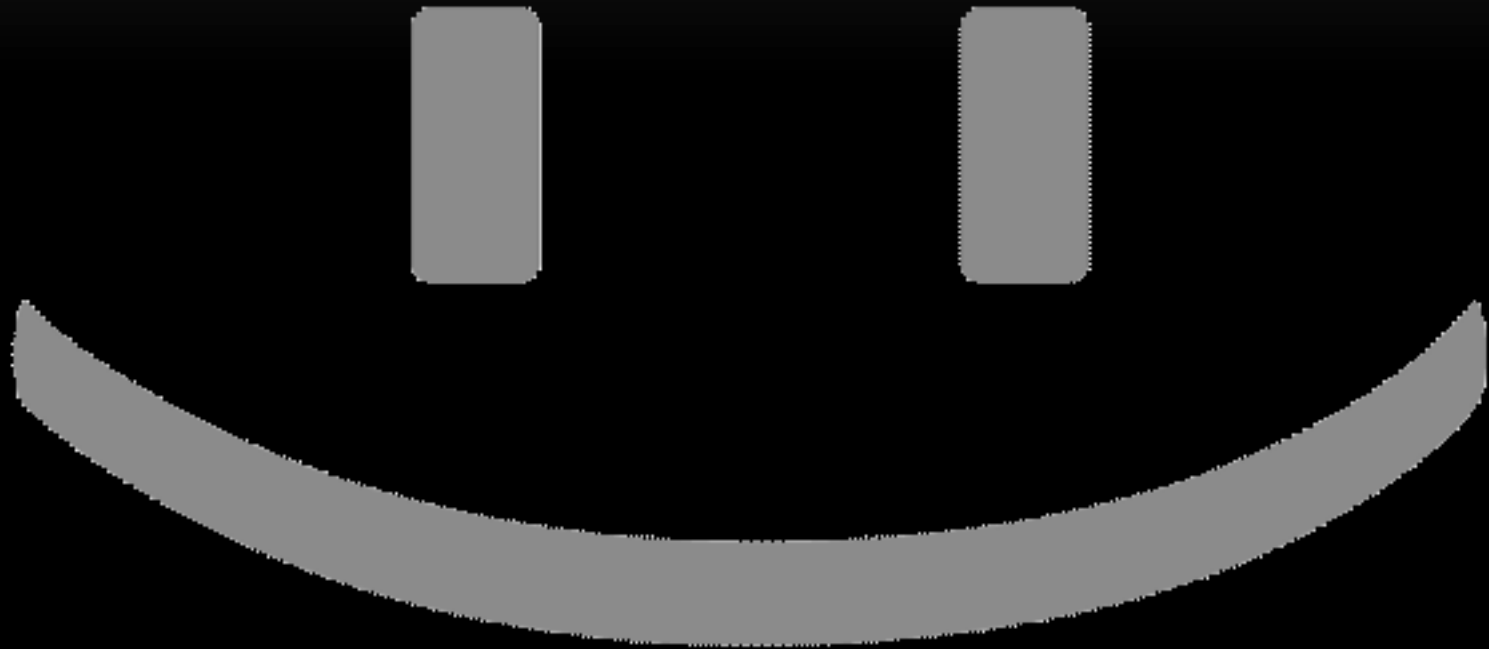
- Liquid: substituted by orthoethoxybenzoic acid (EBA) for part of the eugenol liquid
- Powder: alumina

ZOE PLUS POLYMER

- Liquid: eugenol
- Powder: 20% to 40%: fine polymer particles - Zinc oxide particles



THANK YOU FOR YOUR ATTENTION!



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