Resin Cements

Dental Materials
Sang Park, DDS
When choosing a dental cement...

- We have to consider the following: solubility, erosion, tensile strength, shear strength, toughness, elastic modulus, creep, working and setting time, sensitivity to moisture during and after setting, thermal conductivity and diffusivity, pH during setting, biocompatibility, compatibility with other restorative materials, potential for fluoride release, adhesion to enamel and dentine, sensitivity of setting reaction to temperature, rate of change in viscosity, film thickness, and dimensional change in the presence of moisture.
Hybrid or resin-reinforced glass ionomer cements

- This clinical factor is important when using glass ionomer cements. Examples of traditional glass ionomer cements include Ketac-Cem, Fuji I, and Shofu I.

- The so-called resin-reinforced glass ionomer cements combine an acid-base reaction of the traditional glass ionomer with a self-cure amine-peroxide polymerization reaction. In recent years, the so-called light-curing resin-modified glass ionomer (dual cure) systems have been developed. The resin-modified glass ionomer cements generally have a much lower release of fluoride than the conventional glass ionomer materials.
  - Examples are Fuji Plus, GC America; Protec Cem, Ivocal North America; Relyx-Vitromer, 3M Dental Products
Bonding of esthetic restorations

- The bonding of all-ceramic, tooth-colored crowns, veneers, inlays, and onlays became popular in the late 1980s.
All-ceramic restorations

- Are translucent and require specific shades of cement to maximize their aesthetic appearance.
- Resin cements can reduce fracture of the ceramic structures.
- To achieve the best retention, the undersurface of the glass-ceramic restoration usually is etched, and a silane coating is applied before cementation.
Applications

- Cementation of conventional alloy crowns, bridges, and resin-bonded bridges
- All-ceramic inlays, onlays, and crowns
- Orthodontic brackets.
Advantages vs. Disadvantages

- Bonds to tooth
- Higher strength
- Able to reduce fracture of the ceramic structures
- Virtually insoluble in oral fluid

- High cost
- Hard to handle difficult to remove excess
- Irritating to the pulp
- Film thickness ranges widely from brand to brand
Composition

- Similar to resin-bonded composite filling materials--resin matrix with silane-treated inorganic fillers
- Monomers with functional groups are often incorporated to induce bonding to dentin: organophosphonates, hydroxyethyl methacrylate (HEMA), and 4-methacrylethyl trimellitic anhydride (4-META) system.
- Bonding of the cement to enamel can be attained through the acid-etch technique
Types of resin cements for all-ceramic or indirect restorations

- Self-cured resin cements:
  - Cured chemically by the combination of two components, one containing the catalyst for resin polymerization.
  - Examples: Panavia 21 (J. Morita USA). Bisco C& B (Bisco Dental Products) and Enforce (L.D. Caulk)
- Light-cured resin cements
  - Used when restorations are completely penetrable by light from standard introral curing devices.
  - Examples: Insure (Cosmedent Inc.), Nexus (Kerr Corp.) and Variolink II (Ivoclar North America), without catalyst added.
Dual-cured resin cements

- For restorations that are translucent enough to allow some light penetration, but so thick that full polymerization would not be achieved by light curing alone.

- Examples: Nexus and Variolink II, both used with their respective catalyst.
Manipulation

Self-cured cements:

- The time of excess removal is critical.
- If resin cement is wiped away from the tooth before it sets, leaving margins exposed to air, resin cement at the margins never cures.
- If resin cement is allowed to set to the completely cured state, it is almost impossible to remove the excess cement.
Self-cured cements:

- Resin cement should be removed to the level of margins immediately after seating restorations by flossing interproximal areas or wiping with a sponge.
- Oxygen-blocking chemicals (propylene glycol) should be placed on tooth preparation margins immediately to prevent incomplete polymerization of resin cement at the margins.
Manipulation

- Light-cured cements:
  - The time of exposure to the light that is needed for polymerization of the resin cement is dependent on the light transmitted through the restoration.
  - >40 sec of exposure to light
Manipulation

- Dual-cured cements:
  - The chemical activation is slow and provides extended working time until the cement is exposed to the curing light, at which point the cement solidifies rapidly.
  - It then continues to gain strength over an extended period because of the chemically activated polymerization.
Postoperative sensitivity

- Post-op sensitivity within the first year after cementation in about 37 percent of their patients with crowns; with some brand of cement and bonding agents, up to 11 percent of the teeth require endodontic treatment within the first year.

For acceptable tooth desensitization, most resin cements require adequate use of a bonding-sealing agent between the tooth preparation and the crown.
Use self-etching primer and bond…
desensitizing concept by Christensen

- The smear layer of the tooth preparation is left on the tooth; and the self-etching, self-curing primer is incorporated into the existing smear layer
- Examples: Panavia 21 or Panavia F (J. Morita USA)
Sensitivity after crown cementation with resin 
what to do: