Competitive Product Comparison
GC Corporation FujiCEM™ Luting Cement

Product
GC FujiCEM™ (GC Fuji Luting in Japan) Reinforced Glass Ionomer Luting Cement

Manufacturer
GC Corporation, Tokyo, Japan

Product description and package
- Two part, paste/paste resin-modified glass ionomer luting cement
- Available in a double barrel cartridge for dispensing with the Paste Pak Dispenser
- Pastes are hand-mixed
- One shade – yellow
- Starter kit = 1 Paste Pak Dispenser, 1 FujiCEM refill package and a plastic spatula
- Refill kit = 2 paste cartridges (7.2ml/13.3g paste per cartridge), mixing pad
- Each cartridge is said to contain enough cement for 43 average crowns

Cost per application
(Prices taken from major national dental dealer 2001 catalog)

FujiCEM Luting Cement Starter Package
(includes dispenser) = $148.99
At 43 crown applications/cartridge and 2 cartridges/starter kit or 86 crown applications per kit, cost per application = $1.73

FujiCEM Luting Cement Refill Package (no dispenser) = $122.99
At 43 crown applications/cartridge and 2 cartridges/refill or 86 crown applications per refill, cost per application = $1.43

Compared to:
3M ESPE's RelyX™ Luting Cement #3505 = $95.05
At an average of 80 crown applications/kit, cost per application = $1.19

Manufacturers’ indications for use
- Cementing all types of metal, porcelain fused to metal (PFM) and resin crowns, inlays, onlays and bridges
- Cementing porcelain inlays
- As a base or liner

Manufacturers’ instructions for use
- Load cartridge into Paste Pak dispenser.
- Depress dispenser lever to dispense required amount of pastes onto mixing pad.
- Mix thoroughly for 10 seconds, 15 seconds for large amounts of pastes.
  - The two pastes are similar in color so mix with care.
  - Working time is 3 minutes from start of mix at room temperature (23°C/74°F).
• Clean the prepared tooth with pumice and water.
  – If desired, for stronger adhesion, treat the prepared tooth surfaces with GC Fuji Plus Conditioner for 20 seconds. Rinse and blot dry.
• Coat internal surfaces of restoration with cement and seat within 30 seconds.
• Remove excess cement 1 minute 30 seconds after seating the restoration.
• Maintain isolation until cement has set (approximately 4 minutes 30 seconds).
• Protect exposed margins with GC Fuji COAT LC (light cure 10 seconds) or GC Fuji Varnish.

Manufacturers’ claims
• First paste/paste glass ionomer cement
• Exclusive Paste Pak dispensing system
• Simple to use and easy to mix
• Perfect mix every time
• 15 second mix, 3 minutes working time
• Excess cement removes easily up to 2.5 minutes after seating restoration
• Minimal film thickness
• High fluoride release
• Higher bond strengths
• All the advantages of a true glass ionomer

An independent research institute evaluation
An evaluation of FujiCEM luting cement was conducted and reported by an independent research institute. The ability to dispense the desired amount of cement with the system was reported to solve the need for repeated mixes that take time. Also, the simultaneous dispensing of two pastes assures optimal cement consistency and physical properties. However, the evaluation reported that the similar colors of the two paste components made it difficult to see if the material is well blended. The clinicians found that extended mixing was required to avoid sensitivity. The report also noted that the material emits an unpleasant odor until set. Over 95% of the evaluators rated the product excellent or good yet only 55% stated it would replace products they use currently.

3M ESPE evaluations and discussion

Composition
FujiCEM luting cement contains basic components of a resin-modified glass ionomer – fluoroaluminosilicate glass, polycarboxylic acid, methacylate monomers and water. It also contains hydrophobic methacrylate resins that can adversely affect adhesion to hydrophilic surfaces such as dentin.

Properties
Strength & Toughness*
Adequate strength and toughness have been cited as important physical attributes of luting cements. FujiCEM luting cement was found to be significantly inferior to RelyX luting cement in flexural strength. Its diametral tensile strength was also lower than that of the 3M ESPE resin-modified glass ionomer cement. (Figures 1 and 2). The mean compressive strength values measured for the FujiCEM luting cement and RelyX luting cement were not statistically different. The fracture toughness of RelyX luting cement is high and estimated to be about twice that of the GC paste/paste cement.

![Figure 1. Flexural Strength of RelyX luting cement and Fuji-CEM luting cement](image1)

![Figure 2. Diametral Strength of RelyX luting cement and Fuji-CEM luting cement](image2)

*Testing performed at 3M ESPE laboratory.
Bond Strength*

Shown graphically, the shear bond strength of RelyX luting cement to dentin was higher than that of FujiCEM luting cement when these products were tested comparatively. As indicated by the deviation with the GC product, some samples had zero bond strength. When FujiCEM luting cement was tested with and without the recommended conditioner, no differences were seen in the shear bond strengths to dentin. The bond strengths to enamel were comparable.

**Figure 3. Bond Strength to Dentin of RelyX luting cement and Fuji-CEM luting cement**

Expansion*

The linear expansion of resin-modified glass ionomer luting cements from water uptake has been a topic of much discussion in the dental industry over the past five years. While the true clinical effect of this characteristic remains uncertain, it is generally felt that lower expansion is desirable. The percent linear expansion of FujiCEM luting cement from water uptake is about 80% greater than that of RelyX luting cement. For both products, the majority of the expansion occurs within the first few days in water and then remains constant.

Solubility*

Using water leachable content as a measure of solubility, FujiCEM luting cement was about 40% more soluble than RelyX luting cement.

Film Thickness*

Film thickness of the GC paste/paste cement and that of RelyX luting cement were found to be about equivalent and in the range of 9 – 17 microns.

Fluoride Release*

Both RelyX luting cement and FujiCEM luting cement exhibit high initial and sustained fluoride release.

*Testing performed at 3M ESPE laboratory.

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**Indications**

The indications for use of FujiCEM luting cement are similar to those of RelyX luting cement but also include cementing indirect resin restorations and porcelain inlays. Typically, a resin cement such as 3M ESPE’s RelyX™ ARC Adhesive Resin Cement or Compolute™ Composite Resin Luting Cement are indicated for cementing indirect resin restorations and porcelain inlays due to the need for higher strength, bonding, esthetics and wear resistance required to support these restorations. 3M ESPE does not indicate RelyX luting cement for these indications due to lower strength, esthetic and wear properties compared to the above mentioned resin cements. The physical and mechanical properties of the FujiCEM luting cement are less than or equal to RelyX luting cement and are significantly less than those of resin cements. Additionally, no clinical studies are cited to support the additional indications. If a clinician chooses to use the FujiCEM luting cement for these additional indications, it is recommended that the manufacturer be contacted for additional information to support these indications usually assigned to a resin cement.

**Technique**

The use of a conditioner to obtain stronger adhesion adds extra steps and time to the cementing procedure. 3M laboratory testing showed no improvement in bond strength to dentin when the conditioner was used. Applying Fuji™ COAT LC and light curing for 10 seconds to protect exposed margins are also additional steps that can be time consuming. Such additional procedures are not required with RelyX luting cement.

**Mixing, handling and clean-up**

Because the FujiCEM luting cement pastes are very similar in color, it is difficult to determine when and if they are adequately and thoroughly mixed. Handling of the pastes has been described by an internal dental consultant as more resin-like than glass ionomer-like.

FujiCEM luting cement has a very noticeable and offensive odor. It has been reported in the previously mentioned independent research institute evaluation that FujiCEM luting cement is difficult to remove if allowed to set completely. In a simulation of the clinical use* of FujiCEM luting cement, the cement exhibited a gel state not unlike that of RelyX luting cement but then hardened very rapidly. This rapid hardening could make the cement difficult to cleanup.
**GC Fuji-CEM™ Luting Cement**

**Competitive Product Comparison (continued)**

### Summary of Evaluation

- FujiCEM luting cement is more expensive than RelyX luting cement.
- The FujiCEM dispenser is heavy, somewhat large, awkward and bulky.
- FujiCEM luting cement must be mixed by hand.
- FujiCEM luting cement has an offensive odor before setting.
- FujiCEM luting cement lacks the popular mousse-like handling of RelyX luting cement.
- Important physical properties like flexural strength, diametral tensile strength and solubility of FujiCEM luting cement are inferior to those of RelyX luting cement.
- FujiCEM luting cement’s adhesion to dentin is less than that of RelyX luting cement.
- For the optimal performance of FujiCEM luting cement, more procedural steps are required than with RelyX luting cement.
- The two paste components have a similar color so it is difficult to determine if they are completely mixed.

### 3M ESPE’s RelyX Luting Cement

- Long history of clinical success
- Virtually no post-operative sensitivity
- Zero solubility
- High fracture toughness
- Very easy clean-up
- Mousse-like consistency allowing easy seating