Short fiber-reinforced composite in cementation of fiber-reinforced composite post

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MATERIALS AND METHODS

Two different composites were tested; light-cure flowable short fiber-reinforced composite (SFRC) everX Flow (Dentin, GC, Japan) and dual-cure composite Gradia Core (GC, Japan) (Table 1) (Figure 1). Four groups were made with everX Flow and four with Gradia Core. Two different prefabricated fiber-reinforced composite (FRC) posts (both with diameter 1.6 mm) were used; GC Fiber Post (GC, Japan) and Snowpost (Abrasive Technology, United States) (Table 2). Posts were coated with two different primers; either Ceramic Primer (GC, Japan) or G-multiprimer (GC, Japan). After coating, the posts were placed in the resin composites and pressed along the long axis of the post into thickness of 1.6 mm between two glass plates and then light-polymerized for 20 seconds on 9 points (Figure 2). The post-composite plates were cut to micro-tensile specimen (1.6 mm × 1.6 mm × 18 mm). Eight different FRC groups were made (n= 7 per group). Micro-tensile strength of the specimens were tested with Microtensile tester (BISCO, T6102 K Microtensile United States) (Figure 3). The specimen were attached to the Microtensile tester with metal primer Z (GC, Japan) and G-aenial Universal Flow (GC, Japan). The fracture types were categorized. The data was analyzed using ANOVA followed by Tukey Post Hoc Tests (level of statistical significance 0.05).

Table 1. The tested composite materials used as luting cement.

Material	Type of material	Composition
everX Flow (GC)	Light-cure flowable short fiber-reinforced composite	Silanated short e-glass fibers (ø 6µm and length 100µm) and barium glass fillers (0.7µm), bis-EMA, TEGDMA and UDMA
Gradia Core (GC)	Dual-cure composite	Methacrylic acid ester, fluoro-alumino-silicate glass, silicon dioxide

Table 2. The tested FRC post materials.

Material	Type of material	Composition	Post diameter (mm)
GC Fiber Post (GC)	Prefabricated FRC post	Glass fibers, dimethacrylate matrix	1.60
Snowpost (Abrasive Technology)	Prefabricated FRC post	silica-zirconia fibers, resin matrix	1.60

Figure 1. The tested composite materials used as luting cement: everX Flow and Gradia Core.

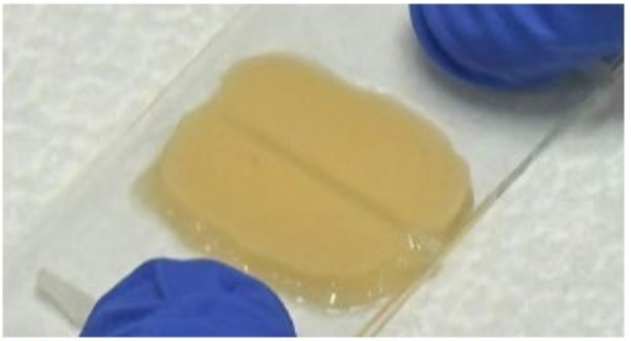

Figure 2. Manufacturing of post-composite plates between glass plates before cutting them into microtensile specimens.

Figure 3. Micro-tensile strength of the specimens was tested with Microtensile tester.

RESULTS

Both composite groups (everX Flow and Gradia Core) had similar bonding values being between 7.5–13.5 MPa. No significant difference in tensile strength between the post and the cement material was found between the groups ($p > 0.05$). The microtensile strength values are shown in Figure 4. The type of primer did not affect the bonding ($p > 0.05$).

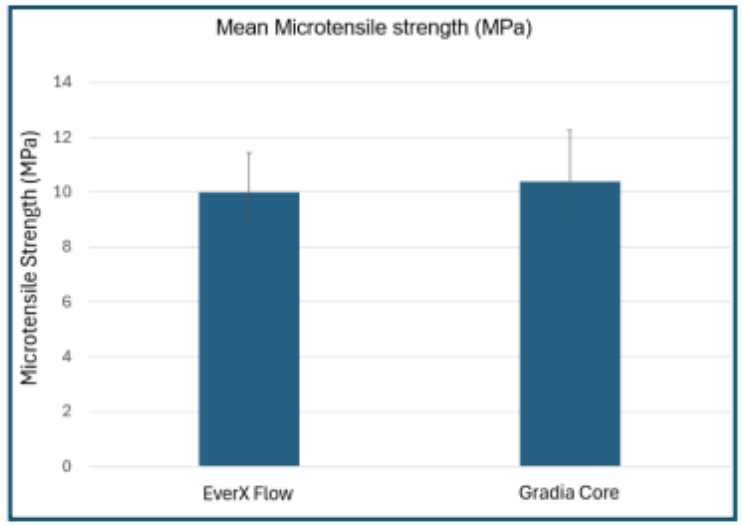

Figure 4. Average bonding values with everX Flow and Gradia Core.

Table 3. Fracture type varied between the post groups.

		GC Fiber Post	Snowpost	Total
Ftacture type	Adhesive	31	5	36
	Cohesive	0	23	23
Total		31	28	59

The fracture types showed significant differences between the post groups ($p < 0.001$) (Table 3). The main fracture type for GC Fiber Post group was adhesive and the main fracture type in Snowpost group was cohesive (Figures 5 and 6). Although fracture type was adhesive in the GC Fiber Post group, the microtensile strength values were almost similar to those of the Snowpost group.

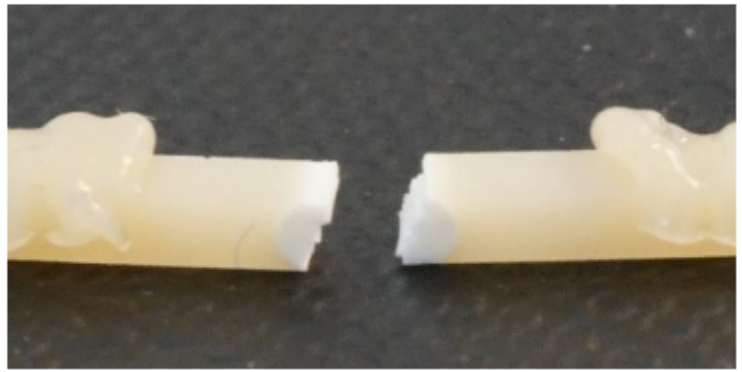

Figure 5. Cohesive fracture type was the main fracture type in Snowpost group.

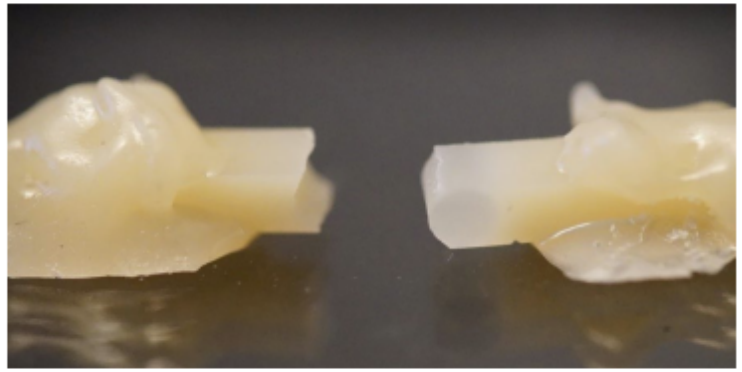

Figure 6. Adhesive fracture type was the main fracture type in GC Fiber Post group.

CONCLUSIONS

EverX Flow revealed similar bonding properties to Gradia Core and could alternatively be used as a luting cement material with fiber-reinforced composite post if light curing of the everX Flow can be confirmed.

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