In Vitro Fracture Resistance and Bond Strength of Self-Adhesively Luted Cast Metal and Fiber-Reinforced Composite Posts and Cores: Influence of Ferrule and Storage Time

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**Purpose:** To evaluate the fracture resistance and bond strength of cast posts and cores (CPCs) and customized glass fiber posts (CFPs) with self-adhesive luting.  
**Materials and Methods:** A total of 56 recently extracted premolars were divided into four groups for the fracture resistance test (CPC and CFP, with and without ferrule) and four groups for the bond strength test (CPC and CFP, immediate and 6 months of storage).  
**Results:** Differences for fracture resistance were found between CPCs and CFPs with ferrule. For bond strength, the interaction between post and root region was significant.  
**Conclusion:** Self-adhesive luting increased fracture resistance of CPCs with ferrule. The ferrule decreased root fractures. Bond strength was similar for both retainers but not for the apical third. Water storage affected bond strength positively. *Int J Prosthodont 2019;32:205–207. doi: 10.11607/ijp.5956*

The prognosis of endodontically treated teeth is related to the post-and-core restorative technique. Despite nonadhesive bonding with conventional luting cements and high elastic modulus, cast posts and cores (CPCs) provide accurate adaptation to the root canal, which could decrease the development of stress-concentrated zones. Customized fiber-reinforced composite posts and cores (CFPs) offer better esthetics and adhesive bonding, as well as a modulus of elasticity similar to that of dentin. However, they are influenced by the amount of ferrule present.

Self-adhesive resin cements offer better mechanical properties and chemical bonding of metal alloys. However, the biomechanical behavior of teeth restored with self-adhesively luted CPCs or CFPs is unclear. This study evaluated the fracture resistance and bond strength of self-adhesively luted CPCs and CFPs, as well as the influence of the coronal remnant in fracture resistance and of the storage time in bond strength. The hypothesis was that the fracture resistance and bond strength of self-adhesively luted CFPs and CPCs would be similar, regardless of ferrule or storage.

**MATERIALS AND METHODS**

The ethics committee of the State University of Ponta Grossa, Paraná, Brazil, approved this study. The selected convenience sample size was based on reports in a previous study. A total of 56 freshly extracted human premolars were decoronated...
For the fracture resistance test, the roots received uniform self-curing acrylic resin crowns (VIPI). A simulation of the periodontal ligament was made. One week later, the specimens received a compressive load (150 N, 0.5 mm/minute) until failure, and the fracture modes were classified as reparable or irreparable.

For the push-out bond strength test, the sample was stored at 100% relative humidity for the baseline length (1 week) or for 6 months. Afterwards, each third of the root was sawed into two slices (1.0 ± 0.1 mm). An optical microscope measured the internal coronal and apical diameters. Each slice was subjected to a push-out test (0.5 mm/minute), and the load (N) converted into MPa by dividing the load by the bonded area.

Fracture resistance and bond strength values were analyzed (SPSS, 24.0) using two- and three-way analysis of variance (ANOVA), respectively, followed by Tukey Honest Significant Difference test ($\alpha = .05$).

### RESULTS

The fracture resistance of the CPCs with ferrule was higher than that of the CFPs with ferrule group (Table 1). The irreparable fracture mode occurred more in the absence of ferrule (Table 2).

The means and standard deviations (SDs) of the bond strength values (MPa) are presented in Table 3. Only the interaction between post and root region was significant ($P = .016$) (Table 4). The bond strength for 1 week (6.0 ± 2.2 MPa) was statistically lower than for 6 months (8.2 ± 2.7 MPa) ($P < .0001$).

### DISCUSSION

CPCs and CFPs presented anatomical adaptation to the root canal and underwent adhesive cementation. These results support the similarities in their biomechanical behavior because CFPs with and without ferrule presented a fracture resistance...
ferrule. The absence of ferrule increased root fractures in CFPs and CPCs. Bond strength was similar between CPCs and CFPs, except for the apical third of the root. Water storage positively affected bond strength for both.

Bond strength and fracture mode results can predict clinical performance. Self-adhesively luted CPCs seem to be a satisfactory (or reasonable) choice for teeth with ferrule because they demonstrated enhanced fracture resistance and bond strength in the apical third and less severe fracture modes. In the absence of ferrule, CFPs and CPCs seem to be viable choices; however, they showed an increased tendency of root fractures and CFPs to post fractures. Clinical studies should be conducted to evaluate the performance and survival rate of these techniques in a clinical setting.

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REFERENCES