Comparison the flexural strength of anatomic posts relined with conventional composite and bulk-fill composites

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Background

In endodontically treated teeth with significant coronal structure loss, there can be issues with adaptation and bonding of prefabricated posts to the root canal. Using anatomic posts coated with bulk-fill composite or other composites can improve the flexural strength.

Objective

The purpose of this study was to evaluate the flexural strength of anatomical post relined with Z350 composite 3M, Bulk Fill composite 3M and Bulk Fill Flowable composite 3M.

Materials

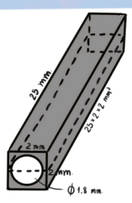
3M™ Filtek™ Z350 Nano Hybrid Universal Restorative

Filtek™ Bulk Fill flowable

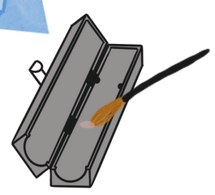
Filtek™ Bulk Fill Pack

DT light post®

Methods



Prepare a custom-made metal splint mold

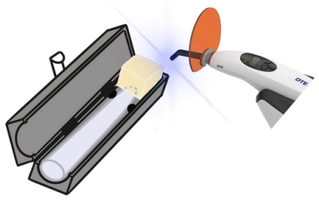


cleaning and applying glycerine separating agent to facilitate easy removal of the specimens after curing.

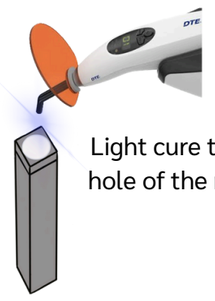
DT light post® will be done surface treatment by etching with 30% hydrogen peroxide 5 minutes, applying silane coupling agent follow by air thinning

AIR DRYING

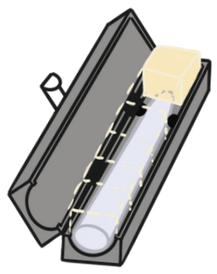
All composite specimens will be prepared by using custom-made metal splint mold.



Open the metal mold and light cure for each incremental layer



Light cure through the hole of the metal mold



Procedure will be repeated until the composite resin fill up to the size of the metal mold

Finally, all specimens will be finished and polished by with 600-grit silicon carbide paper and kept in distilled water 24 hours.

Universal testing machine (EZ test, Shimadzu, Japan)

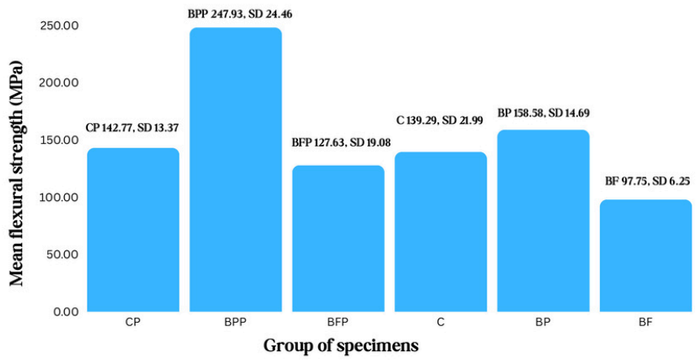
Flexural strength evaluation (ISO 4049:2019

Gold Coater Jeol Model JFC-1200

Scanning electron microscope (FEI QUANTA FEI 200, FEI Company, Oregon, USA)

Results

Flexural strength testing



Statistical analysis

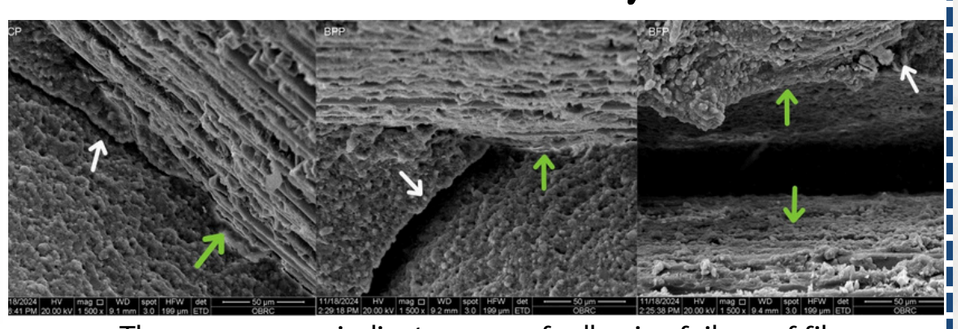
Group	N	Mean	Std. Deviation	F test	P-value
CP	15	142.77[bc]	13.37	124.78	<0.001*
BPP	15	247.93[d]	24.46		
BFP	15	127.63[b]	19.08		
C	15	139.29[b]	21.99		
BP	15	158.58[c]	14.69		
BF	15	97.76[a]	6.25		

*Groups with the same lowercase superscripted letter indicated no significant differences between groups at p-value<0.05.

One-way ANOVA

Tukey's Honestly Significant Difference (HSD) test

Visual surface analysis



The green arrow indicates area of adhesive failure of fiber post specimens relined with composites.
The white arrow indicates area of cohesive failure of fiber post specimens relined with composites.

Conclusion

Anatomic post which relined with different types of composites resulted in differences in the flexural strength. Fiber post that incorporated with Filtek™Bulk Fill Posterior Restorative 3M composite presented flexural strength results superior to that incorporated with Filtek™ Z350 composite 3M and Filtek™ Bulk Fill Flowable Restorative 3M.

Filtek™ Bulk Fill Posterior Restorative composite 3M demonstrated flexural strength comparable to that fiber post relined with Filtek™ Z350 composite from 3M, as well as a fiber post relined with Bulk Fill Flowable 3M.

Discussion

- This study investigated the effect of different composites including conventional resin-based, bulk-fill, and bulk-fill flowable on the flexural strength of anatomic fiber posts. Results showed that fiber posts relined with bulk-fill composites had the highest flexural strength, likely due to their higher filler content (76.5-80 wt%) compared to bulk-fill flowable composites (64.5-72.5 wt%) and reduced polymerization shrinkage stress. Bulk-fill composites were found to be comparable in flexural strength to conventional composites and could serve as an alternative for relining fiber posts in endodontically treated teeth.
- Limitations included the lack of fatigue testing and the use of non-anatomical specimen shapes, which may have influenced the accuracy of flexural strength results. Most failures in fiber post groups were mixed, while composite groups showed cohesive failures due to material uniformity.
- Overall, bulk-fill composites demonstrated promising potential as a material for relining fiber posts and coronal restorations in clinical procedures. Future studies should explore additional mechanical properties, such as flexural modulus and fracture resistance, to further validate these findings.

Keywords

flexural strength, anatomic posts, fiber post, fiber post relined, reinforcement, Bulk Fill composites, conventional composites

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