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Flexural Property Comparison between Splint Materials

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INTRODUCTION

Dental splints are often comprised of fibers, such as polyethylene or glass, embedded within a resin matrix. They are used in a variety of applications to stabilize, support, and/or reinforce teeth or restorations. Consequently, their flexural properties are important.

OBJECTIVE

The objective of this study was to compare the flexural strengths and stiffness of four commercially available fiber-reinforced splints.

MATERIALS & METHODS

Four commercially available fiber-reinforced splints [n=7/group], Splint-S: 3 mm Uni-Axial (SFC, LLC., Wallingford, Connecticut, USA), Splint-S: 2 mm Braided (SFC), everStick® C&B (GC America, Inc., Alsip, Illinois, USA) and Ribbond Original (Ribbond, Inc., Seattle, Washington, USA) were used for this study. Specimens were prepared in Teflon molds, polymerized with a curing light and curing box, stored in distilled water for 24 hours at 37°C, ground with Silicon Carbide paper to remove flash from the edges, measured with a caliper, and tested via 3-point bending (Instron Corporation, Norwood, Massachusetts, USA) at 1 mm/min with a test span of 20 mm. Flexural Strength and Modulus were calculated and compared with ANOVA/Tukey (IBM SPSS Statistics, Armonk, New York, USA).

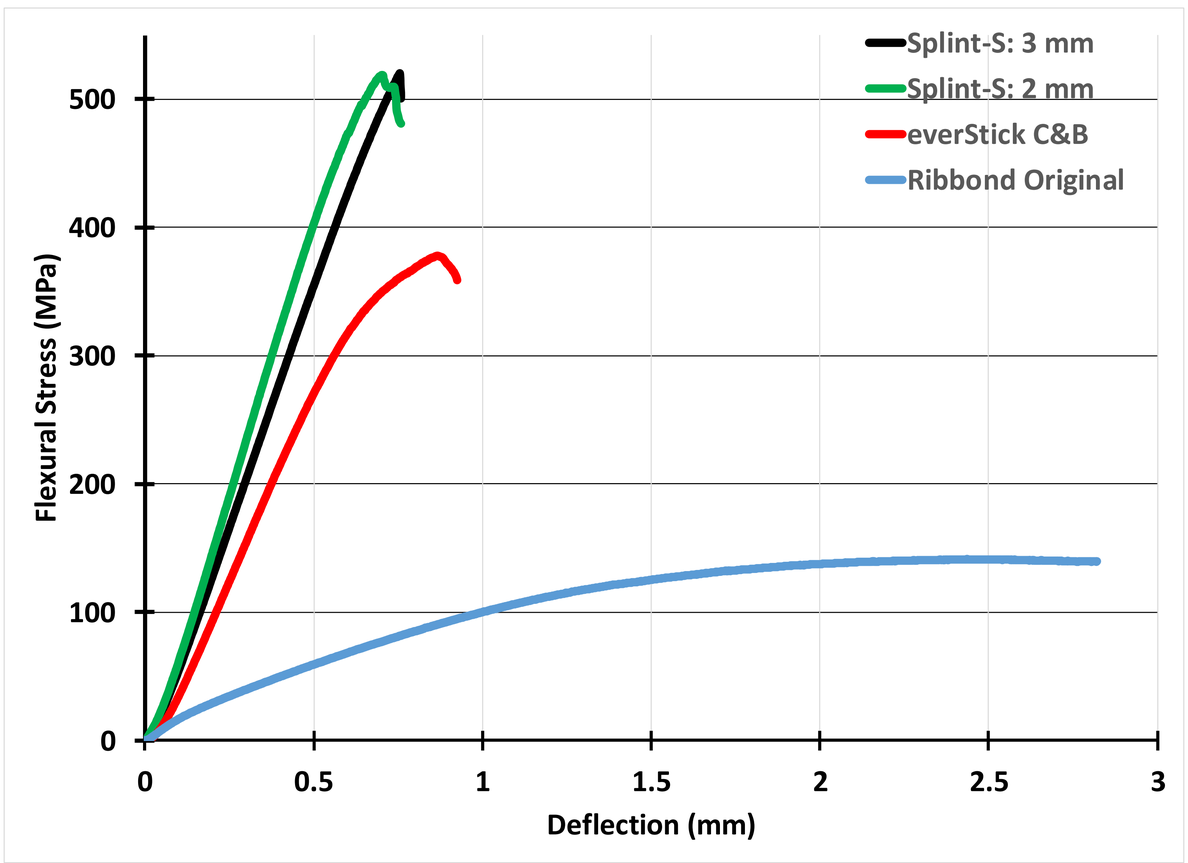
Flexural testing of the splint materials.

RESULTS

The flexural strengths (MPa) of the four materials are listed in the Table below. The Splint-S materials were significantly ($p<0.05$) stronger than everStick C&B, which was significantly ($p<0.05$) stronger than Ribbond Original. The Table also lists the flexural moduli (GPa) of the four materials. Splint-S: 3 mm and Splint-S: 2 mm were significantly ($p<0.05$) stiffer than everStick C&B, which was significantly ($p<0.05$) stiffer than Ribbond Original.

Splint Material	Flexural Strength (MPa)	Flexural Modulus (GPa)
Splint-S: 3 mm	504 ± 32	22.1 ± 1.8
Splint-S: 2 mm	514 ± 68	24.6 ± 1.6
everStick C&B	362 ± 44	15.4 ± 3.7
Ribbond Original	105 ± 21	0.7 ± 0.2

Flexural Stress vs Deflection curves are shown below. Consistent with the values in the Table, Splint-S: 3 mm and Splint-S: 2 mm show greater flexural strength and stiffness. Ribbond Original allowed a greater amount of deflection before losing strength, but was the weakest of the four materials. Intermediate in properties was everStick C&B.



CONCLUSION

A wide variety of flexural strengths and moduli exist among splint materials. The Splint-S products were the strongest and stiffest splint materials in combination.

ACKNOWLEDGEMENTS

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