OBJECTIVES

The goal of this study was to evaluate the difference of diametral tensile strength obtained from commercially available fiber posts for cementation in root canals. The null hypothesis is that there is no difference between the manufacturers in diametral tensile strength.

BACKGROUND

Dental restorative materials undergo loading and unloading cycles that stress materials in unique and varied ways. The diametral tensile strength measurement is a test that uses compression on the side of a cylinderically shaped sample until the material breaks. Ultimately what causes the material to break is in tension in the middle of the material. This test was originally developed to test dental composites since a way that they fail is through occusal forces causing pressure, which acts in a way to cause failure of the restoration through tensile fracture. By compressing a cylinder of restorative material, its ability to withstand fracture can be measured, thereby validating its utility as a dental restorative material. While these tests have mainly been used for dental composites, it is a useful evaluation for any dental material that will come up against this type of stress. A post is used when a tooth is endodontically treated and additional support is desired for stability of the coronal restoration. A post provides retention and durability by using the inside of the canal wall for bonding. Fiber posts have gained popularity in recent years because they can flex with the dentin instead of resisting it, and therefore prevent horizontal root fractures that can occur with metal posts.

MATERIALS AND METHODS

Commercially available fiber posts from 13 different companies were selected in two different size ranges (1.2 mm and 1.5 mm in diameter). The following manufacturers and post types have been included in this study.

Group 1: 3M ESPE-Relay-Fiber Post; Group 2: Arthur A. Dugoni School of Dentistry, San Francisco

REFERENCES

3 Mouchumi Bhattacharyya. Forces causing pressure, which acts in a way to cause failure of the restoration through tensile fracture. By compressing a cylinder of restorative material, its ability to withstand fracture can be measured, thereby validating its utility as a dental restorative material. While these tests have mainly been used for dental composites, it is a useful evaluation for any dental material that will come up against this type of stress. A post is used when a tooth is endodontically treated and additional support is desired for stability of the coronal restoration. A post provides retention and durability by using the inside of the canal wall for bonding. Fiber posts have gained popularity in recent years because they can flex with the dentin instead of resisting it, and therefore prevent horizontal root fractures that can occur with metal posts.

RESULTS

Statistical significant differences among groups regarding the diametral tensile strength has been found. When adjusting for the different diameters the strength varies among companies (p<0.0002). The null hypothesis was rejected.

CONCLUSION

While most fiber post tested in this study showed results between 20 and 40 MPa three out of 13 products tested had superior diametral tensile strength values. A fatigue analysis with the post cemented into the root canal could help to determine if the products of this study with higher strength tested in static conditions will also present higher values in a dynamic testing performance. Further investigations should be made to determine if higher Diametral Tensile Strength results in longer survival rate for dental restorations.

Two Way ANOVA analysis was used at a 95% confidence interval. The statistical computing was performed using open source statistical software R from the Free Software Foundation's GNU General Public License, USA, 2014.

REFERENCES

3 Mouchumi Bhattacharyya. Forces causing pressure, which acts in a way to cause failure of the restoration through tensile fracture. By compressing a cylinder of restorative material, its ability to withstand fracture can be measured, thereby validating its utility as a dental restorative material. While these tests have mainly been used for dental composites, it is a useful evaluation for any dental material that will come up against this type of stress. A post is used when a tooth is endodontically treated and additional support is desired for stability of the coronal restoration. A post provides retention and durability by using the inside of the canal wall for bonding. Fiber posts have gained popularity in recent years because they can flex with the dentin instead of resisting it, and therefore prevent horizontal root fractures that can occur with metal posts.

DISCUSSION

It is assumed that all manufacturers of fiber posts fabricate posts with similar diametral tensile strength. They all should accommodate the physical properties of dentin in the same way. From the materials tested we found three manufacturers that have posts on the market with a diametral tensile strength in average of more than 40 MPa. The French based company RTD is specialized in products containing fibers in different ways. The Product Macro-Lock Revolution X40 had the highest mean value for the smaller diameter range and the highest mean value for the higher diameter range. This was followed by Henry Schein - Clear Parallel Post and Pentron - FibreKlee products.

CONCLUSION

While most fiber post tested in this study showed results between 20 and 40 MPa three out of 13 products tested had superior diametral tensile strength values. A fatigue analysis with the post cemented into the root canal could help to determine if the products of this study with higher strength tested in static conditions will also present higher values in a dynamic testing performance. Further investigations should be made to determine if higher Diametral Tensile Strength results in longer survival rate for dental restorations.

REFERENCES

3 Mouchumi Bhattacharyya. Forces causing pressure, which acts in a way to cause failure of the restoration through tensile fracture. By compressing a cylinder of restorative material, its ability to withstand fracture can be measured, thereby validating its utility as a dental restorative material. While these tests have mainly been used for dental composites, it is a useful evaluation for any dental material that will come up against this type of stress. A post is used when a tooth is endodontically treated and additional support is desired for stability of the coronal restoration. A post provides retention and durability by using the inside of the canal wall for bonding. Fiber posts have gained popularity in recent years because they can flex with the dentin instead of resisting it, and therefore prevent horizontal root fractures that can occur with metal posts.

DISCUSSION

It is assumed that all manufacturers of fiber posts fabricate posts with similar diametral tensile strength. They all should accommodate the physical properties of dentin in the same way. From the materials tested we found three manufacturers that have posts on the market with a diametral tensile strength in average of more than 40 MPa. The French based company RTD is specialized in products containing fibers in different ways. The Product Macro-Lock Revolution X40 had the highest mean value for the smaller diameter range and the highest mean value for the higher diameter range. This was followed by Henry Schein - Clear Parallel Post and Pentron - FibreKlee products.

CONCLUSION

While most fiber post tested in this study showed results between 20 and 40 MPa three out of 13 products tested had superior diametral tensile strength values. A fatigue analysis with the post cemented into the root canal could help to determine if the products of this study with higher strength tested in static conditions will also present higher values in a dynamic testing performance. Further investigations should be made to determine if higher Diametral Tensile Strength results in longer survival rate for dental restorations.