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EVOLVING WITH PEEK?

Dental Science

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ABSTRACT

Advance in dentistry and development of technologies can be reached by improving materials. Biocompatibility, low plaque affinity, good aesthetics and characteristics close to dental structure are essential to modern materials used in advanced dentistry. PEEK is a material which is non allergenic, highly biocompatible and having the Young's modulus of 3-4 Gpa. The elastic modulus of PEEK is close to that of dentin and bone.In some studies the fracture of root was minimised if a post material which had tensile properties closer to tooth was used. Hence, in the presented study peek was used as a post material. However, these properties of the material can be useful only if it can be luted efficiently. Hence, the aim of the study is to compare the shear bond strength of peek posts with dentin when two types of luting agentsare used.

KEYWORDS

PEEK, BioHPP, Young's Modulus, luting cements, PEEK posts

INTRODUCTION

Advance in dentistry and development of technologies can be reached by improving materials.Biocompatibility, low plaque affinity, good aesthetics and characteristics close to dental structure are essential to modern materials used in advanced dentistry.PEEK is white, radiolucent, rigid material with great thermal stability up to 335.8° C. It is non allergic and has low plaque affinity Young's (elastic) modulus of PEEK is 3-4 GPa. Young's modulus and tensile properties are close to human bone, enamel and dentin. Modified PEEK containing 20% ceramic fillers known as BioHPP (Bredent GmbH Senden, Germany) is non allergic and has high biocompability.Possibility of corrections, excellent stability, great optimal polishable properties and aesthetic white shade of BioHPP help to produce high-quality prosthetic restorations.

The aim of the presented paper was to compare and evaluate two luting cements for luting of BioHPP post to dentin.

MATERIALS AND METHOD

Materials

- 10 extracted teeth
- Biohpp posts
- 3m resin modified glass ionomer cement
- Panavia f2 resin cement
- Diamond bur and airoter
- Tooth sectioning disc
- Universal testing machine

METHOD:

20 extracted teeth were collected, access opening was done, canal were located and after cleaning and shaping were filled with gutta percha. All the teeth were decoronated. Post space preparation of all teeth was done using pesoreamer.

EXTRACTED TEETH

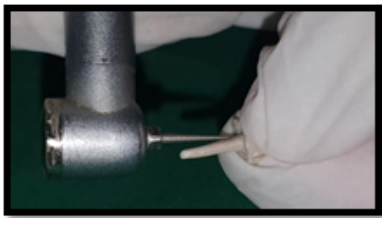
IMPRESSION USING PATTERN RESIN, DECORONATED TEETH AND PEEK POST

Impressions of post space was made using pattern resin with indirect technique.The impressions were scanned and milled in biohpp using CAD CAM.The posts along with their corresponding teeth were randomly divided into 2 groups of 10 teeth each.The posts in the first group (GROUP A) were luted to their corresponding tooth roots with resin modified glass ionomer cement (3M ESPE Relyx luting cement).

Similarly the posts in the second group (GROUP B) were luted to their corresponding roots with dual cure resin cement (Panavia F2.0 resin cement).

Group A: 3M ESPE LUTING AGENT

Group B: PANAVIA 2.0 LUTING AGENT



SURFACE ROUGHENING DONE WITH AIROTER AND BUR

The roots were sectioned with a sectioning disc,each section being 2mm in thickness.The discs were embedded in dental stone for testing.Universal testing machine was used to determine the push out force in newton.Statistical analysis was done using student t-test.

GROUP A AND GROUP B SECTIONED DISCS

SECTIONED DISCS EMBEDDED IN DENTAL STONE

Discs On Universal Testing Machine To Measure The Push Out Strength

RESULTS

The mean shear bond strength of the peek posts luted with resin modified glass ionomer cement (3M ESPE Relyx luting cement) was 13.06 Mpa with SD being 1.38. The mean shear bond strength of the peek posts luted with dual cure resin cement (Panavia F2.0 resin cement) was 9.55 Mpa with SD being 0.37. By application of student t test, it was found that the shear bond strength of group A was significantly higher than that of the samples of group B. This means that PEEK posts show better bond with the root dentin when luted with resin modified glass ionomer cement than with dual cure resin cement.

DISCUSSION

Biohpp posts were fabricated using CAD/CAM technology since it was stated by Stawarczyk et al that industrial pre-pressing process for the CAD/CAM blanks increased the stability of PEEK and its veneering restorations and reduced risk of porosities and therefore showed improved mechanical properties. [1,2]

According to Newmann MP et al the fracture of root was minimised if a post material which had tensile properties closer to tooth was used. [3]Use of bioHPP as post material was done as young's modulus and tensile properties are close to human bone, enamel and dentin and also because of excellent biocompatibility and dimensional stability which is required for post material.

Diamond point was used to alter the surface of the posts .The other effective alterations use concentrated sulphuric acid or hydrofluoric acid which cannot be used in clinical environment.

There is very minimal literature regarding bond strength of dentin to bioHPP. Patrick R. et al and Regina Furbino et al found shear bond strengths, which were below the clinically acceptable levels.[4] However Schmidlin et al.has reported good results. The exact mechanism of adhesion of this material is not completely established.[5]Some SEM (stereo electron microscope) studies revealed the formation of tags at the dentin-cement interface resulting from the Resin Reinforced Glass Ionomer (RMGIC) polymer penetration into the dentinal tubules.

The application of surface-altering solutions to dentin prior to bonding with glass-ionomer cements has been reported by many authors to increase the bond strength. Fuji Plus Conditioner is a mild polyacrylic acid solution designed to remove the dentinal smear layer and to condition dentin and enamel before the application. It will increase the bond between glass ionomer cement and tooth structure for added longevity.These can explain the higher result of Fuji Plus cementing agent than RelyX Unicem. However none of studies so far have used biohpp as post. Hence more such studies are required to confirm the results obtained in the above study.

CONCLUSION

Resin Reinforced Glass Ionomer (Fuji Plus) showed better shear bond strength than Dual-cure Resin Cement (RelyX Unicem Aplicap) with CAD/CAM High-performance polymers (BioHPP).

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