Evaluation of the Fracture Resistance of Fluorapatite-Veneered Zirconium Crowns with 3 Different Coronal Core Foundations

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Introduction

Preparing molars for full coverage restorations that have had previous restorations such as large composites, amalgams, or cuspal fractures are common practice in dentistry. After excavation and preparation, these vital teeth frequently have voids in their coronal structure, or cusps that have been fractured off of the prepared tooth. Different modalities of treatment exist to build up these fractured natural cusps prior to crown placement. Composite cores are frequently utilized, as well as allowing the luting cement to the final crown to fill in the void of the fractured tooth structure. It has been demonstrated that cores build up materials have an influence on the fracture strength of luteal and luteo-ceramic restorations. 

Methods and Materials- Preparation

There is little information regarding the foundation restoration for a vital, non-endodontically treated tooth that has a cuspal void where the zirconium core is not contacting sound dentin. The rationale for this study is to evaluate the effect of foundation core build up techniques on fractured non-endodontically treated teeth and the effect on full coverage Fluorapatite-Veneered Zirconium restorations. With the demand for improved esthetics, increasing cost of alloys and advancements in dental materials, the popularity for all ceramic crowns is increasing. Zirconium has the highest fracture strength compared to glass ceramics and alumina, therefore is widely used in dental ceramics.

Materials and Methods- Fabrication

Prefabricated Crown Forms used for consistency in porcelain thickness (1.3 mm)

Ivoclar Vivadent e.max ZirPress

Testing

Instron machine placed static compressive force onto marked cusp

Group 1: Void filled with luting cement LTF- 796 N Time- 120 sec

Group 2: Void filled with zirconia LTF- 1170 N Time- 121.5 sec

Group 3: Composite Core to restore tooth LTF- 1416 N Time- 117 sec

Group 4: Control, crown on sound dentin LTF- 1293 N Time- 140 sec

Results - Discussion

Higher mean value of resistance between the groups regarding time, p=0.01. There is no statistical significance regarding fracture resistance. There is no statistical significance between the groups regarding time, p=0.22. It can be concluded that with regards to restoring a natural non-endodontically treated molar, zirconia veneered-fluorapatite full coverage restorations can handle masticatory loads in the posterior jaw. Clinical significance of research reveals that fractured molars should be restored with composite core build-up prior to crown fabrication.

Results - Mean Load to Failure (LTF) and Time

Group 1: Void filled with luting cement LTF- 796 N Time- 120 sec

Group 2: Void filled with zirconia LTF- 1170 N Time- 121.5 sec

Group 3: Composite Core to restore tooth LTF- 1416 N Time- 117 sec

Group 4: Control, crown on sound dentin LTF- 1293 N Time- 140 sec

Conclusions

After statistical analysis (Kruskal-Wallis) we can conclude that there is a statistical significance between the cement fill-in group of p=0.01 regarding fracture resistance. There is no statistical significance between the groups regarding time, p=0.22.

References