Fracture resistance of endodontically treated premolars with extensive MOD cavities restored with different composite formulations

(An In vitro Study)

A thesis

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Abstract

Unresolved controversy exists concerning the preferred restorative materials and techniques used to restore endodontically treated maxillary premolars to improve their resistance to fracture under occlusal load. The aim of this study was to evaluate the fracture resistance, types and mode of failure in endodontically treated maxillary premolar teeth with weakened class II MOD cavities restored with low shrinkage silorane-based composite (Filtek P90) and a nanohybrid composite (Filtek Z250 XT) both filled with incremental technique and in comparison to bulk-fill, flowable composite (SDR) (Smart Dentine Replacement).

Fifty human adult maxillary premolar teeth were selected for this study. Standardized class II MOD cavity preparations with endodontic treatment were prepared for all teeth, except those that were saved as intact control. The teeth were divided into five groups of ten teeth each (n=10): (Group 1) intact control group, (Group 2) unrestored teeth with endodontic treatment, (Group 3) restored with (Filtek Z250 XT), (Group 4) restored with SDR bulk-fill flowable composite and (Group 5) restored with Filtek P90 silorane-based composite. All specimens were subjected to compressive axial loading until fracture in a universal testing machine. The data were statistically analyzed using one-way ANOVA test and LSD test. Macroscopic fracture type were observed and classified into favorable and unfavorable. Specimens in group 3, 4 and 5 were examined by stereomicroscope at a magnification of 20× to evaluate the mode of failure (adhesive, cohesive or mixed).

Based on the findings of this study, all experimental composite restoration showed significant improvement in the resistance to cuspal

fracture in comparison to unrestored one. The use of bulk-fill flowable composite improved the fracture resistance significantly in comparison to silorane and non-significantly to Filtek Z250 XT. Filtek Z250 XT showed better improvement in fracture resistance but with no significant differences in comparison to silorane-based composite restorations. However the type of failure was unfavorable for all the restored groups.

Under the conditions of this study, direct composite restorations should be considered as a valid interim restoration for weakened endodontically treated teeth before cuspal coverage can be provided.