

**The Influence of Cavity Design for Cusp Coverage
on Fracture Strength of Weakened Maxillary
First Premolars Using Two Esthetic Restorative
Systems (CAD/CAM Hybrid Ceramic and
Nanohybrid Composite)**

(An in Vitro Study)

A thesis

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By

Zainab Salman Jawad

B.D.S., H.D.D.

Supervised by

Prof. Dr. Abdul Karim J. Al-Azzawi

B.D.S., M.Sc.

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Abstract

Maxillary first premolar has distinctive morphology make it more susceptible to fracture. Moreover, this tooth situated in a strategic zone that becomes visible during speaking and smiling, necessitating the use of tooth colored restorative materials. Ceramics and composites are materials of choice to repair these teeth and restore their esthetic. The aim of this study was to assess the influence of cavity design for cusp coverage on the fracture resistance of weakened maxillary first premolar restored with two esthetic restorative systems (CAD/CAM hybrid ceramic and nanohybride composite).

Fifty six intact maxillary first premolars of approximately comparable sizes were divided into seven groups eight for each: **Group A:** Intact teeth (control group); **Group B:** teeth prepared for MOD inlay; **Group C:** teeth prepared for MOD onlay covering the lingual cusp; **Group D:** teeth prepared for MOD covering buccal and lingual cusps ,the previous three groups indirectly restored with nanohybrid composite(3M ESPE Z 250 XT); **Group E:** the teeth prepared with the same design as group B; **Group F:** teeth prepared as that in group C; **Group G:** teeth prepared for onlay as in group D, the last three groups restored with CAD/CAM hybrid ceramic (VITA ENAMIC).

An axial compression test was used to measure the fracture strength of experimented teeth using universal testing machine. The readings were analyzed statistically by t-test, one way ANOVA and LSD, then the mode of fracture had been examined. The results showed that sound teeth in group (A) had more fracture resistance values than all experimental groups and the difference were highly significant with group (B, E, F, G), significant with group (D) and non-significant with group (C). When the influence of cavity design tested among composite groups it showed highly significant difference between group (B) and (C), whereas the influence of cavity design among Enamic groups showed highly significant difference between group (E) and (G).

T-test between similar designs showed non-significant difference between MOD groups and highly difference between other groups.

Cusp coverage increased the fracture resistance of composite groups but result in non-restorable fracture, while Enamic total onlay presented promising fracture resistance with favorable mode of fracture.