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Comparison of fracture strength of bilayered crown systems under static loading –An in vitro study

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Abstract:

Aims: This study evaluates and compares fracture strength of ceramic crowns fabricated with metal, zirconia and lithium disilicate as core materials.

Settings and Design: Comparative –In-vitro *experimental* study design.

Methods and Material: A total of 36 crowns were fabricated with metal(Group-I)(Co-Cr alloy, Ivoclar Vivadent,USA), Zirconia(Group-II)(3M, Germany) and Lithium disilicate(Group-III)(Ivoclar Vivadent,USA) (n=12) as coping material over a standardized metal die of maxillary first premolar ivorine tooth. All the copings were layered with ceramic with a standardized hand layering technique. All the specimens were cemented with resin modified glass ionomer cement(Reva Sem, SDI) on individual metal dies under a constant load of 20 N for 15 mins by universal testing machine(UTM). All the cemented specimens were tested for fracture strength at a constant crosshead speed of 0.5mm/min until fracture under universal testing machine.

Statistical analysis used: One-way ANOVA test and Post-hocBonferroni test.

Results: Mean fracture strength of groups were: Group I (Porcelain fused to metal - PFM) = 2911.92N, Group II(Porcelain fused to Zirconia- PFZ) = 2617.92N, Group III (Porcelain fused to Lithium disilicate) = 1407.17N. One way ANOVA showed significant difference($p<0.05$) in mean fracture strength between the three groups. Post-hoc bonferroni test showed significant inter-group difference between Groups I and III and Groups II and III .The difference between Groups I and II was non-significant.

Conclusions: Within the limitations of the study, the comparison of mean fracture strength between the three groups shows significant difference was seen between PFM, PFZ and PF Lithium disilicate. Group III PF to lithium disilicate showed lowest mean fracture strength values followed by Group II(PFZ),Group I(PFM) showed highest mean fracture strength. All three materials should be used judiciously on the basis of the results of the study.

Key-words: Fracture strength, Lithium disilicate, Zirconia, delamination.

Key Message: This study draws clinician's attention towards different coping materials considered for fabrication of bilayered crowns with comparable fracture strengths. Selection of the material should be done judiciously as per the results of the study relating to the clinical scenario.

Abbreviations- PFM- Porcelain fused to metal

PFZ- Porcelain fused to zirconia

PF Lithium disilicate- Porcelain fused to lithium disilicate

UTM- Universal testing machin

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