An Evaluation of The Influence of Different Finishing Lines on The Fracture Strength of Full Contour Zirconia CAD/CAM and Heat Press All-Ceramic Crowns. (An in vitro study)

A Thesis
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Abstract

One of the major problems of all ceramic restorations is their probable fracture against the occlusal forces. The objective of this in vitro study was to evaluate the effect of two gingival finishing lines (90°shoulder and deep chamfer) on the fracture strength of full Zolid zirconia CAD/CAM (AmannGirrbach, Germany) and full Cergo Kiss heat press ceramic crowns (DeguDent, Germany).

Thirty two freshly extracted sound and caries free maxillary first premolars for orthodontic reasons were collected. The teeth were divided into two groups (16 for each group), one for 90°shoulder gingival finishing line and the other for deep chamfer. Each group was divided equally into two subgroups to receive crowns (8 teeth for Zoild crowns and 8 teeth for Cergo Kiss crowns). Each crown was cemented to its corresponding tooth using self-etch, self-adhesive dual cure resin cement. The specimens were stored in distilled water at room temperature for one week, then subjected to 500 thermal cycles between 5°C and 55°C with dwell time of 30 seconds. Fracture resistance was determined using a universal test machine with statistical ball of 5mm in diameter at center of occlusal surface along the long axis of the cemented crowns with a crosshead speed of 0.5 mm/min until fracture occurred, and the samples were investigated microscopically from the point of view of the origin of the failure. Statistical analysis was carried out using the one-way ANOVA and student's t-test.

The mean values of fracture strength and standard deviation for Zolid group were 1367.250±178.967 N for 90°shoulder margins, and for deep chamfer margins were 1109.250±252.455 N, while the mean values of fracture strength and standard deviation for Cergo Kiss group were 548.562±272.471 N for 90°shoulder margins, and 247.912±96.995 N for the deep chamfer margins expressing statistical significance. ANOVA test results revealed very high significant differences between and within the groups. The student's t-test revealed statistically significant differences between the similar and different groups ($P<0.05$). In general, the student's t-test revealed very high statistical significant differences between the Zolid and the Cergo Kiss subgroups ($P<0.001$).

As a conclusion, the results of this study pointed to a relationship between the design of the gingival finishing margin and the fracture strength of the full CAD/CAM crowns and the full heat press ceramic crowns. For posterior crowns, the 90ºshoulder margin would be more preferable than the deep chamfer especially for the heat press full crowns.