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The Effect of Porcelain Veneering on Marginal Fitness of Zirconia Copings Compared to Full Contour Zirconia Crown Using Three Different CAD/CAM Systems

(An in Vitro Study)

A Thesis

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Abstract

Marginal fitness is considered a very important factor for the long-term success of dental restorations. Computer aided design/Computer aided manufacture (CAD/CAM) systems have been continuously developed and upgraded in association with zirconium oxide materials, especially yttria-tetragonal zirconia polycrystals (Y-TZP), which gaining popularity these days due to its superior mechanical properties as a core combined with promising esthetic results achieved by the application of veneering porcelain.

The purpose of this study was to evaluate the effect of veneering process on the vertical marginal gap of zirconia copings and comparing with full contour zirconia crowns designed and milled with three different CAD/CAM systems.

An ideal pre-prepared plastic dentoform model of a single posterior full-crown preparation with chamfer finish line design was used as a master die. The model was duplicated 48 times and poured in type IV dental stone for the fabrication of working dies that randomly divided into three major groups (A, B and C) (n=16) according to the CAD/CAM system being used. Each group further subdivided into two subgroups (n=8) full-contoured and traditionally veneered zirconia crowns. The working stone models for each group were scanned, then restoration were designed and milled with CAD/CAM system to produce eight zirconia crowns that milled to full anatomy (Group A₁, B₁ and C₁) and eight zirconia copings (Group A₂, B₂ and C₂), which were veneered later with feldspathic porcelain (Group A₃, B₃ and C₃).

Marginal gaps were evaluated on the master model in relation to four defined points on each aspect (Buccal, Mesial, Lingual and Distal). Using

the direct view technique with the aid of Stereomicroscope at (a magnification of 140X) and (image J) program. The measurement was done once for each full contoured sample and twice for the coping; before and after veneering.

The results of this study showed that the lowest mean of marginal gap was recorded for Group B₂ (Copings before veneering, Sirona system) (58.39 μ m \pm 2.83) and the highest mean was Group C₃ (Copings after veneering, Zirkozahan system) (107.69 μ m \pm 7.11). The data were statistically analyzed, using One-way ANOVA and LSD tests which revealed highly significant differences ($p < 0.001$) among groups. Student paired and independent t-tests results revealed that the veneered zirconia crowns produced significantly greater marginal gap compared to that of both copings, and full contoured crowns for each system correspondingly.

As a conclusion, the addition of veneering porcelain increases the vertical marginal discrepancy. The zirconia crowns that milled to full anatomy have better marginal fit than the traditionally veneered crowns. Sirona system showed the best marginal fit than the others. All systems have an acceptable marginal fit clinically.