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The Effect of Finishing Line Designs and Occlusal Surface Reduction Schemes on Vertical Marginal Fit of Full Contour CAD/CAM Zirconia Crown Restorations (A comparative *in vitro* study)

A thesis
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Abstract

Marginal fit plays an important role in the clinical success and longevity of ceramic restorations since great marginal discrepancies lead to more dental plaque retention, periodontal inflammation and secondary caries. This study was planned with an aim to evaluate and compare the effect of using different finishing line designs (deep chamfer and shoulder) with different occlusal surface reduction schemes (planar and flat) on the vertical marginal fit of full contour CAD/CAM zirconia crown restorations.

Thirty-two sound maxillary first premolar teeth of comparable size and shape freshly extracted for orthodontic purposes were selected and collected to be used in this *in vitro* study.

Teeth were divided into two main groups according to the design of finishing line used (n=16): **Group A**: Deep chamfer design; **Group B:** Shoulder design. Each group was then subdivided into two subgroups according to the scheme of occlusal reduction used (n=8): **(A_1, B_1)** Planar occlusal reduction scheme (Anatomical); **(A_2, B_2)** Flat occlusal reduction scheme (Non-anatomical). Standardized preparation for full contour zirconia crown restorations was carried out with finishing lines depth 1.0 mm, total convergence angle of 6 degrees and axial height 4 mm. The teeth were then scanned directly using digital intra-oral scanner technique (Sirona AC Omnicam camera). Full contour zirconia crown restorations were then fabricated using Sirona In-Lab MC X5 milling device.

Rely X U200 (3M ESPE) self-adhesive resin cement was used as a luting agent in this study.

Vertical marginal gaps were measured at four points on each tooth surface. Sixteen points per tooth sample were measured using a digital

microscope at a magnification of (280X). The measurements were done at two intervals (pre-and post-cementation).

The results of this study revealed that the least marginal gaps were recorded at pre-cementation interval for **A_1 (38.837±9.30 µm)**, **B_2 (50.763±12.88 µm)**, **A_2 (63.199±9.22 µm)** and **B_1 (66.636±8.57 µm)** respectively**.** Post-cementation, the same scenario was seen, but with generally higher values for all subgroups**.** Comparison of significance among the different subgroups using one-way ANOVA test showed a statistically highly significant differences ($p < 0.01$). Further, comparison between each two subgroups using Student's t-test revealed a statistically highly significant differences ($p < 0.01$). Additionally, comparison of significance between each pair of subgroups pre- and post-cementation using Paired-Samples t-test showed a statistically highly significant differences.

As a conclusion, deep chamfer finishing line provided more accurate seating of full contour CAD/CAM zirconia crown restorations rather than the shoulder finishing line, when using planar occlusal reduction scheme as it provided better marginal fit than shoulder finishing line.

On the other hand, shoulder finishing line provided better marginal fit than the chamfer one, when using flat occlusal reduction scheme.

Concerning the effect of the cementation procedure, the marginal gap was increased post-cementation as compared with the pre-cementation gap for all subgroups, but still within the clinically acceptable limit.