Assessment of Zirconia Crowns Marginal Discrepancy Using Different Preparation Designs

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Introduction: Misfit of the prosthesis margin creates a potential space between the restoration and prepared tooth that can accumulate bacterial plaque and consequently jeopardize the longevity of the treatment.

Objective: this study is to investigate the influence of different finish line widths (0.5; 1.0; 1.2mm) and crown thicknesses (0.8 and 1.5mm) on the marginal fit of monolithic zirconia crowns using the manufacturer recommended standard sintering protocol.

Materials and methods: Six customized titanium implant were used to fabricate the master abutments for monolithic zirconia crowns. Crown were designed virtually. Zirconia crowns were milled using partially sintered "green-stage" zirconia blocks. 6 test groups (n=10) were elected randomly for standard sintering, G1: 0.5mm chamfer, 0.8mm thickness, G2: 0.5mm chamfer width, 1.5mm thickness, G3: 1.0mm chamfer, 0.8mm thickness, G4: 1.0mm chamfer width, 1.5mm thickness, G5: 1.2mm chamfer, 0.8mm thickness, G6: 1.2mm chamfer width, 1.5mm thickness. Crowns were sintered according to manufacture recommended sintering protocols using one conventional sintering furnace. The marginal gaps were assessed, using a Leica microscope coupled with a digital camera. Vertical marginal gaps were determined using 8 predetermined measuring points. The photographs were taken and the image were processed with image analysis software (Image J software 1.32; U.S. National Institutes of Health). All measurements were made perpendicular to the crown.

Results: Two-way analysis of Variance showed significant differences (<0.001) between the finish line thickness and marginal gaps, the crown thickness and marginal gaps as well as the interaction between them (finish line and crown thickness). Marginal gaps were higher in the thinner crowns with 0.5mm finishlines compared to thicker crowns occlusally. Monolithic zirconia crowns with 1.0mm thickness and thinker crowns showed less marginal gaps compared to thicker crowns with 0.5mm finishline.

Conclusion: This study showed that preparation designs have great influence in monolithic zirconia marginal discrepancy.

Acknowledge: Ivoclair Vivadent Company