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The effect of marginal cement space thickness on the marginal and internal fitness of monolithic zirconia crowns using different types of luting agents

(A comparative *in vitro* study)

A thesis

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Abstract

The marginal and internal fitness are very essential factor for the success of all ceramic restoration. The aim of this in vitro study is to compare and evaluate and the effect of different marginal cement space parameter settings in the CAD software on the marginal and internal fitness of monolithic zirconia crowns with different types luting agents (Rely X™ Ultimate adhesive luting agent, Rely X™ Unicem 200 self-adhesive luting agent and Riva luting plus resin-modified glass ionomer cement).

Forty-eight sound human maxillary first premolar teeth of comparable size and shape extracted for orthodontic purposes were collected and selected to be used in this study.

All the teeth were prepared by one operator with the aid of modified dental surveyor to receive a monolithic zirconia crown restoration according to the guidelines recommended for KATANATM zirconia with the following preparation features: chamfer finishing line 0.8mm, axial reduction1.5mm,occlso-gingival height 4mm (palataly and buccally) ,anatomical occlusal reduction and total convergence angle 6º.

The prepared teeth were scanned with inEos X5 extra -oral digital scanner and divided into two main groups according to the setting of marginal cement space parameter in designing software of CAD/CAM mode (n=24) as follow: **Group I:** 0 μm cement space around the margin (the present parameter already installed in the software) and additional cement space of 80 μm starting 1mm above the finish lines of the teeth. **Group II:** 25μm cement space around the margin and additional cement space of 80 μm starting 1mm above the finish lines of the teeth. Each

group was further subdivided into three subgroups according to the type of luting material (n=8) :**(IA, IIA)** subgroups cemented with Rely X™ Ultimate adhesive luting agent,**(IB,IIB)** subgroups cemented with Rely X™ Unicem 200 self-adhesive luting agent and **(IC,IIC)** subgroups cemented with Riva luting plus resin-modified glass ionomer cement .

The internal and marginal fitness of each crown was evaluated by direct measurement of cement film thickness through sectioning procedure. The measurements were done using a digital microscope in (μm) (Dino- Lite capture) at a magnification of 60 X and at eleven different measuring points for each specimen, which represented four different areas of measurement: margin, chamfer, axial and occlusal.

The data were statistically analyzed using independent t-test, one – way ANOVA test, Tukey's Honest Significant Difference (HSD) test and person's correlation test.

This study showed that the least marginal gap was recorded by subgroup IIA (45.17, ± 4.85) followed by IIB (50.43, ± 3.26), IIC (54.79, ± 3.20), IA (61.21, ± 5.14), IC (70.85, ± 6.53) and IB (76.68, ± 4.10) respectively. On the other hand the least internal gap was recorded by subgroup IIB (58.08, ±4.81) followed by IIC (60.73, ± 4.96), IIA (63.47, ±7.42),IA (95.45, ± .58), IC (102.88, ± 5.29) and IB (105.58, ± 4.80) respectively.

The study results showed that different levels of adaptation were observed for all subgroups with the highest mean value of the gap recorded at the occlusal area and the lowest mean value recorded at the marginal area.

All subgroups showed higher internal than marginal gap with a positive correlation in Group I and negative in Group II. The marginal

and internal gaps of all groups of this study fall within the clinically acceptable limits.

As a conclusion, the using of 25μm cement space at the marginal area of the finishing line results in better marginal and internal fitness of zirconia crowns. On the other hand the Rely X™ Ultimate adhesive luting agent provided the lowest marginal and internal gaps as compared with other types of luting agents used in this study.