# Marginal Integrity of Turkom-Cera Compared to Other All-Ceramic Materials: Effect of Finish Line

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> The aim of this study was to evaluate the marginal adaptation of Turkom-Cera allceramic crowns compared to In-Ceram and Procera AllCeram systems. The influence of finish line design (chamfer or shoulder) on the marginal adaptation of Turkom-Cera all-ceramic crowns was also investigated. Thirty human premolars were prepared with chamfer margins and assigned to either the Turkom-Cera, In-Ceram, or Procera system group. In addition, 10 premolars were prepared with rounded shoulder finish lines and assigned to an additional Turkom-Cera group. Ceramic copings (0.6-mm thick) were fabricated for each group following the manufacturers' instructions. The copings were seated on abutments using a special holding device that facilitated uniform loading, and marginal adaptation was assessed using a stereomicroscope. Data were analyzed using analysis of variance, the Tukey HSD post hoc test, and an independent samples t test. There was a statistically significant difference regarding marginal adaptation among the three all-ceramic systems (P < .05). There were no significant differences in the mean marginal discrepancies of Turkom-Cera crowns among chamfer and shoulder finish line groups (P > .05). Within the limitations of this study, the marginal discrepancies were all within the clinically acceptable standard. Int J Prosthodont 2011;24:379-381.

Marginal fit is an important factor for the success and longevity of an indirect restoration because an inadequate adaptation of the restoration can result in damage to the tooth and its supporting periodontium.<sup>1</sup>

Presently, there are no definite standards that exist regarding what constitutes a clinically acceptable margin.<sup>2</sup> All data should be analyzed under the consideration of the study design. McLean and von Fraunhofer<sup>3</sup> concluded that a marginal opening of 120 µm represents the maximum clinically acceptable gap size. However, studies on the marginal adaptation of Turkom-Cera (Turkom-Ceramic) are lacking. Therefore, the purpose of this study was to evaluate the marginal adaptation of the Turkom-Cera allceramic system and compare it to In-Ceram (Vita Zahnfabrik) and Procera AllCeram (Nobel Biocare) systems. In addition, this study evaluated the influence of finish line on marginal adaptation for the Turkom-Cera all-ceramic system.

# **Materials and Methods**

Forty caries- and crack-free maxillary premolars were used in this study. The teeth were prepared for allceramic crowns in a standardized manner with an axial taper of 6 degrees, a 1.2-mm chamfer/shoulder margin, and a total preparation height of 4 mm. Thirty teeth were prepared with a chamfer margin and divided randomly into three groups (Turkom-Cera, In-Ceram, and Procera) of 10 specimens each. The remaining 10 teeth were prepared with a shoulder margin and used with the Turkom-Cera system to study the influence of finish line on marginal adaptation. The three all-ceramic systems were used for crown fabrication. All copings were prepared with a 0.6-mm thickness following the manufacturers' instructions.

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Fig 1 Specimen fixed in the custom-made holding jig.



**Fig 2** Computer screen showing the marginal gap of a specimen (magnification ×30).

#### Table 1 Marginal Gap (µm) of Turkom-Cera, In-Ceram, and Procera Copings

				95% Confidence interval		
	N	Mean	SD	Lower bound	Upper bound	Median
Turkom-Cera	10	49.2	12.2	40.48	57.91	46.50
In-Ceram	10	71.5	13.7	61.68	81.34	68.58
Procera	10	34.4	10.9	26.59	42.17	30.50

SD = standard deviation.

**Table 2**Pairwise Comparison of Turkom-Cera Groups Using an IndependentSamples t Test

Variable	Chamfer mean (SD)	Shoulder mean (SD)	Mean difference (95% CI)	t statistic (df)	Р
Marginal gap	49.2 (12.2)	44.0 (10.8)	5.22 (-5.58, 16.03)	5.14 (18)	.323
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SD = standard deviation; CI = confidence interval.

The copings were seated on the teeth without cementation using a custom-made holding device (Fig 1). A force of 10 Ncm was placed on the upper screw of the holding device. The marginal gap (Fig 2) of each specimen was reproduced at a magnification of  $\times$ 30 (Stereomicroscope, Olympus SZ61-ILST Set, Olympus) on a high-resolution (1280  $\times$  800 pixel) computer monitor, and the images were captured using a digital camera (Xcam-Alpha, The Imaging Source). Then, video images of the marginal gap were examined using image analysis software (Cell^B, Olympus Soft Imaging Solutions). The marginal gap was determined as the vertical opening between the

outermost edge of the crown margin and the prepared tooth margin. The marginal gap of each crown was measured 3 times at 50 points along the coping margins, for a total of 150 measurements per coping. Marginal fit of the crown was defined as the mean value of these 150 measurements.

Statistical inferences among the three all-ceramic groups were made using one-way analysis of variance (ANOVA) and the Tukey HSD multiple range test ( $\alpha = .05$ ). Furthermore, an independent samples *t* test was used to determine the significant differences between the two groups of Turkom-Cera copings with chamfer and shoulder finish lines.

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# Results

The mean and median marginal gap, standard deviation, and 95% confidence interval for Turkom-Cera, In-Ceram, and Procera crowns with chamfer margins are listed in Table 1. ANOVA and the Tukey HSD post hoc test showed that the mean marginal gaps of the three all-ceramic systems differed from each other significantly (P < .05).

An independent samples *t* test was used to determine significant differences between the two Turkom-Cera groups with chamfer and shoulder margins (Table 2). There was no significant difference between the two groups (P > .05).

# Discussion

The development of ceramic systems with improved strength and esthetics has widened the use of all-ceramic restorations for anterior and posterior regions. In addition to fracture resistance and esthetics, marginal accuracy is of clinical importance and influences the success and longevity of all-ceramic restorations.<sup>2,4,5</sup>

According to the results of this study, the mean marginal discrepancies for Turkom-Cera (49.2  $\pm$  12.2  $\mu$ m), In-Ceram (71.5  $\pm$  13.7  $\mu$ m), and Procera (34.4  $\pm$  10.9  $\mu$ m) copings differ from each other significantly (P < .05). Procera crowns had the lowest marginal discrepancy, whereas In-Ceram crowns had the highest marginal discrepancy. In this study, finish line design did not influence marginal adaptation of Turkom-Cera copings. Although the shoulder finish line (44.0  $\pm$  10.8 µm) showed a smaller marginal gap than the chamfer finish line (49.2  $\pm$  12.2 µm), statistical analysis revealed no significant differences between them (*P* > .05).

# Conclusion

The results of this study show that the accuracy of fit achieved by the three ceramic systems was within the range of clinical acceptance.

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#### Literature Abstract

#### Healthy Eating Index is a predictor of early childhood caries

The purpose of this study was to examine the relationship of dietary quality as measured by the Healthy Eating Index (HEI) to the prevalence of early childhood caries (ECC) in 2- to 5-year-old children, while taking into account racial and socioeconomic differences. Data from the Third National Health and Nutrition Examination Survey was used for this study. This survey was conducted between 1988 and 1994 based on a complex, multistage sample plan. The population for this study consisted of 3,912 children who were at least 2 to 5 years of age with complete dental and HEI records. The mean and 95% confidence interval was calculated for HEI, which provides a measure of the overall quality of an individual's diet based on recommendations in the Dietary Guidelines for Americans. It is composed of 10 component scores, each ranging from 0 (poor) to 10 (good). Poverty income ratio, which is the ratio of household income to the threshold income for poverty, was also obtained. Two commonly accepted classifications for ECC were used in this study: (*1*) simple ECC and (*2*) severe ECC. Logistic regression was used to analyze the association of HEI to ECC while adjusting for significant confounders. Children in the uppermost tertile of the HEI (best dietary habits) were 44% less likely to exhibit severe ECC compared with children in the lowest tertile of the HEI (worst dietary habits). Results of this study suggest that a healthy eating pattern geared for promotion of optimal child development and prevention of chronic disease may reduce the risk of severe ECC.

Nunn ME, Braunstein NS, Krall Kaye EA, Dietrich T, Garcia RI, Henshaw MM. J Dent Res 2009;88:361–366. References: 33. Reprints: Dr Martha Nunn, Creighton University School of Dentistry, 2802 Webster Street, Omaha, NE 68178. Email: marthanunn@creighton.edu—Alvin G. Wee, Omaha, NE

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