Short Communication

Marginal Fit of Titanium Metal-Ceramic Crowns

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Purpose: This study aimed to compare the marginal fit of 2 kinds of metal-ceramic crowns—crowns cast from commercially pure titanium and Procera titanium crowns. ***Materials and Methods:*** Ten copings of each type were prepared, veneered with low-fusing porcelain, and bonded with glass-ionomer cement. Marginal fit was assessed before and after cementation, and the data were analyzed statistically. ***Results:*** There were significant differences among mean values of marginal fit between the groups. Cementation increases discrepancies in both groups. ***Conclusion:*** Casting titanium has resulted in the highest discrepancies in marginal fit of both groups. *Int J Prosthodont 2005;18:390–391.*

An acceptable fit of crowns is essential clinically, but a definitive value for an acceptable marginal fit is difficult to establish.[1] Titanium has been suggested as a replacement for the alloys currently used in fixed prosthodontics, but information on the marginal fit of titanium crowns is limited, and the results of studies are contradictory.[1–4]

The purpose of this study was to compare the marginal fit of crowns: *(1)* cast from commercially pure titanium (cpTi) and *(2)* fabricated with the Procera titanium system (Nobel Biocare), before and after cementation. The hypothesis was that the Procera system would produce a better marginal fit.

Materials and Methods

Twenty standardized specimens of brass, with a chamfer 1 mm circumferentially, were prepared to received metal-ceramic crowns. For the cast titanium group, 10 copings were waxed on the dies, invested with a phosphate-bonded investment (Biotan, Schütz Dental), and cast with cpTi (Biotan, 99.5% Ti, Schütz Dental) in a titanium casting machine (Rematitan Autocast, Dentaurum JP Winkelstroeter KG). In the second group, 10 copings were fabricated with the Procera technique (Nobel Biocare). Both groups were veneered with low-fusing porcelain (Vita Titan, Vita). All crowns were luted with glass-ionomer cement (Ketac Cem, 3M/ESPE).

The marginal fit was measured before and after cementation at the same 4 points (buccal, lingual, mesiobuccal, and distobuccal). The fit was assessed by measuring the distance between the crown margin and preparation cavosurface angle.

An image analysis program (Optimas 6.1) connected to an Olympus SZ 4045TR-CTV 40× magnification loupe with a built-in Sony charge-coupled distributor camera, was used for measurements.

The data obtained were statistically analyzed using 1-way and 2-way analysis of variance (ANOVA).

Results

Figure 1 shows the marginal fit for both groups before and after cementation. The fit of Procera titanium crowns was significantly better before and after cementation (gap of 14 ± 6 μm and 28 ± 6 μm, respectively; $P < .0001$) than those of cast titanium (55 ± 16

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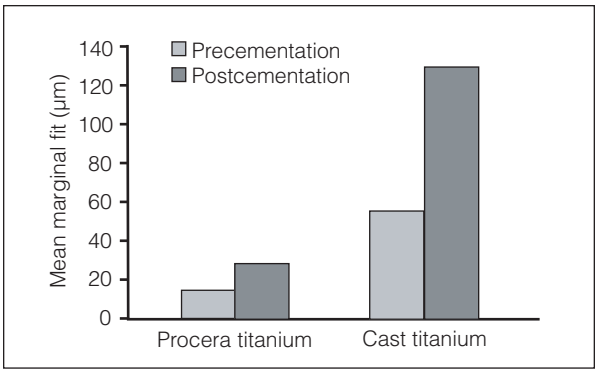

Fig 1 Mean value (in microns) of the marginal fit for both groups.

μm and 128 ± 32 μm, respectively). Two-way ANOVA showed significant differences ($P < .0001$) in marginal adaptation between both groups, independent of cementation. Therefore, significant differences ($P < .0001$) were found respect to cementation, independent of the group, so discrepancies after cementation were always greater than before cementation.

Conclusions

The results of this study showed that the Procera system had the smallest marginal gap and that cementation increased the marginal gap in both groups. The results also demonstrate that precision casting of titanium is somewhat more difficult than with the Procera system. These differences are clinically relevant, because the marginal gap at cast crowns after cementation was larger than 100 μm.

Acknowledgments

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Literature Abstract

Effect of storage solution on surface roughness of provisional crown and fixed partial denture materials

The surface roughness of provisional crowns and fixed partial denture materials is important to maintain or improve periodontal health and esthetics during treatment periods. This study measured the effect of saliva-like storage solution on surface roughness of different provisional materials. Twelve materials (5 methacrylate resin and 7 bis-acrylic resins) were prepared with 10 specimens each (25 × 25 × 2 mm). Each specimen was polished in a controlled manner and measured for baseline surface roughness. Half of the specimens were stored in artificial saliva (1 L double distilled H_2O, 1.6802 g $NaHCO_3$ 0.41397 g, $NaH_2PO_4 \cdot H_2O$, 0.11099 g $CaCl_2$) and the other half were stored in artificial saliva-coffee solutions. Following storage at 37°C for 2 weeks, all specimens were reoriented and measured. In baseline measurements, although 1 brand of methacrylate resins had the greatest surface roughness, methacrylate resins in general exhibited smoother surfaces than bis-acrylic resins. There were significant increases in roughness after storage in both solutions. The authors concluded that provisional materials exhibiting less initial surface roughness may undergo greater surface roughness change in a moist environment.

Haselton DR, Diaz-Arnold AM, Dawson DV. *J Prosthodont* 2004;13:227–232. **References:** 18. **Reprints:** Dr Debra R Haselton, VCU School of Dentistry, Wood 207, 521 North 11yh Street, PO Box 980566, Richmond, VA 23298. E-mail: drhaselton@vcu.edu—*Eunghwan Kim, Lincoln, NE*