# Short Communication

# **Marginal Fit of Zirconia Posterior Fixed Partial Dentures**

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> The aim of this study was to investigate the marginal fit of posterior fixed partial dentures (FPDs) made with 2 computer-aided design/computer-assisted manufacture systems— Procera Bridge Zirconia (Nobel Biocare) and Lava AllCeramic System (3M ESPE) and to analyze the differences between abutments and between buccal and lingual surfaces. Twenty standardized specimens were prepared to receive posterior 3-unit FPDs. FPDs were fabricated according to the manufacturer's instructions. A scanning microscope (JSM-6400, JEOL) with a magnification of  $1,000\times$  was used for measurements. Three-way analysis of variance showed significant differences (P < .001) in marginal adaptation between the ceramic groups. Procera Bridge Zirconia showed the lowest discrepancies ( $26 \pm 19 \mu m$ ). No significant differences were observed between abutments and surfaces, and no significant interaction was observed among the ceramic system, abutments, and surfaces. The accuracy of fit achieved by both zirconia systems was within the range of clinical acceptability, with Procera Bridge Zirconia showing the best marginal fit. *Int J Prosthodont 2008;21:398–399.*

For many years, high stress-bearing posterior fixed partial dentures (FPDs) were regarded as a contraindication of all-ceramic materials. However, developments in ceramic materials such as zirconium oxide cores, as well as in the field of computer-aided design/computer-assisted manufacture (CAD/CAM), have opened new paths for all-ceramic restorations.<sup>1-3</sup>

Although the accuracy of fit has a considerable effect on the clinical success of the restorations,<sup>4</sup> there are only a few studies using the new zirconium oxide ceramics and CAD/CAM technology, especially in posterior FPDs.<sup>5</sup>

The aim of this study was to investigate the marginal fit of posterior fixed partial dentures (FPDs) made with 2 computer-aided design/computer-assisted manufacture systems—Procera Bridge Zirconia (Nobel Biocare) and Lava AllCeramic System (3M ESPE)—and to analyze the differences between abutments and between buccal and lingual surfaces. The hypothesis was that there were no

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Correspondence to: Dr María J. Suárez, Department of Buccofacial Prosthesis, University Complutense, Pza Ramón y Cajal s/n, 28040 Madrid, Spain. Fax: 34 913941910. E-mail: mjsuarez@ odon.ucm.es significant differences in the marginal fit between the ceramic systems, abutments, and surfaces.

### **Materials and Methods**

Twenty standardized steel specimens with 2 abutments and a base (30 mm in length, 17 mm in width, and 4.5 mm in thickness) were prepared to receive posterior 3-unit FPDs. The finish line of the abutments was a chamfer 1 mm circumferentially, and the angle of convergence was 6 degrees. For the Procera Bridge Zirconia group, 10 zirconia cores were fabricated and veneered with Nobel Rondo Zirconia (Nobel Biocare). In the second group, 10 Lava cores were fabricated and veneered with Lava Ceram (3M ESPE). All FPDs were luted with glass-ionomer cement (Ketac Cem EasyMix, 3M ESPE) applying a standardized load of 10 N/cm<sup>2</sup> for 10 minutes, with a dynamometric key (USAG 820/70, Utensilerie).

The marginal fit was measured at the same points in the middle of the buccal and lingual surfaces and marked with an indelible marking pen. The fit was assessed by measuring the distance between the crown margin and preparation cavosurface angle.

A scanning microscope (JSM-6400, JEOL) with a magnification of  $1,000 \times$  and the software Inca Suite 4.04 (Oxford Instruments) was used for measurements. Sixty measurements were recorded for each specimen (30 per abutment). Measurements were always taken at the same points, and each specimen was positioned



Fig 1 Marginal fit of both ceramic groups.

leaning in a base at an angle of 25 degrees, so the interface was positioned perpendicular to the optic axis of the microscope.

The data were statistically analyzed using 3-way analysis of variance (ANOVA) ( $20 \times 20 \times 20$ ) with repeated measurements in 2 factors (abutments and surfaces).

#### Results

Figure 1 shows the marginal fit for both ceramic groups. The fit of the Procera system was lower ( $26 \pm 19 \mu m$ ) than that of the Lava system ( $76 \pm 36 \mu m$ ) (Fig 2). Three-way ANOVA showed significant differences (P < .001) in marginal adaptation between both ceramic groups, but no significant differences were observed for marginal fit between abutments (P = .37) or between surfaces (P = .14). No significant interaction was observed between ceramic systems and abutments (P = .44), ceramic systems and surfaces (P = .69). No significant interaction was observed among the ceramic systems, abutments, and surfaces (P = .92).

#### Discussion

During the last decade, there has been an increased interest in using FPDs with ceramic frameworks, but there are only a few studies available that discuss their behavior. In the present study, Procera showed better misfit values than Lava, which could be due to the different digitization system between both systems.<sup>2</sup>

In this study, no differences between abutments for both zirconia systems were demonstrated, and no studies were found comparing discrepancies between the abutments of FPDs. In addition, no differences were observed between surfaces (buccal or lingual) for both zirconia systems, and no studies were found concerning this topic. This could be explained by the precision of the digitization system and of the mechanized technique of both ceramic systems analyzed.



**Fig 2** Scanning electron microscopy showing the marginal gap (52 µm) (white arrow) of a Lava specimen (magnification ×1,000).

It is important to keep in mind that dental technicians play an important role during the different processing phases of CAD/CAM restorations. In this study, 2 dental technicians performed the necessary procedures for each system, so it is possible that this factor influenced the results.

## Conclusions

The results of this study show that the accuracy of fit achieved by both all-ceramic systems was within the range of clinical acceptability. Procera Bridge Zirconia showed lower discrepancies than the Lava All-Ceramic System.

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