# Prognosis of Zirconia Ceramic Fixed Partial Dentures: A 7-Year Prospective Study

Diego Lops, DDS, PhD[a]/Daniela Mosca, DDS[a]/Paolo Casentini, DDS[a]/Marco Ghisolfi, DDS, PhD[a]/Eugenio Romeo, DMD, DDS[b]

The aim of this study was to evaluate the time-dependent clinical efficacy of anterior and posterior zirconia fixed partial dentures (FPDs). A convenience sample of 28 patients, each wearing 1 FPD, was recalled annually throughout a 6-year follow-up period (mean: 6.5 years). Four patients did not participate in the study (dropouts), and 24 FPDs were in use during the observation period. The cumulative survival and success rates were 88.9% and 81.8%, respectively. Fixed prostheses with zirconia frameworks may be regarded as acceptable alternatives to metal-ceramic anterior and posterior FPDs. *Int J Prosthodont 2012;25:21–23.*

The apparent increase in patients' awareness of dental esthetics has encouraged research efforts to introduce substitute materials for traditional metal-ceramic prostheses.[1] The recent popularity of zirconia ceramic fixed partial dentures (FPDs) demands time-dependent studies of their clinical effectiveness. This preliminary prospective study reports the clinical outcomes of a small number of such anterior and posterior FPDs.

## Materials and Methods

A convenience sample of 28 patients (13 males, 15 females; mean age: 46.2 years) from the Saint Paul Hospital Dental Clinic, University of Milan, Italy, was selected for this study. Patients had a self-reported need for improved esthetic prosthetic treatment (n = 17) or their previous metal-ceramic fixed prostheses needed replacement (n = 11). Computer-aided design/computer-assisted manufacture technology was used for the fabrication of zirconium oxide frameworks from partially sintered zirconium oxide blanks. The 28 FPDs consisted of 18 anterior and 10 posterior FPDs (Table 1 and Figs 1 to 4). The intent was to evaluate the prostheses annually during an established follow-up period.

The following periodontal parameters were recorded immediately after cementation (baseline evaluation) of the prostheses and at the control visits: probing pocket depth (PPD), recorded at four sites per tooth; bleeding on probing (BoP); and Plaque Index (PI).

Clinical evaluation of each prosthesis was recorded in terms of clinical fracture resistance, marginal adaptation, and discoloration according to the modified Ryge clinical criteria.[2] Marginal integrity was evaluated clinically using a calibrated plastic probe and instrumentally by means of standardized periapical radiographs.

Descriptive statistics were applied to the data, and patients lost to follow-up were recorded as dropouts. FPD cumulative survival and success rates were calculated by means of life table analysis. The chi-square test with the Yates correction index was used to find any significant difference of complications between anterior and posterior FPD rehabilitations. The level of statistical significance was fixed at .05, and all tests were two-tailed. All analyses were performed using SAS statistical software version 9.1 (SAS Institute). The comparison of PPD, PI, and BoP values between baseline and last evaluation was carried out using the McNemar test.[3]

## Results

Four patients had moved and could not be reached by the end of the seventh observational year (mean: 6.5 years). They were recorded as dropouts, and therefore this report applies to the 24 FPDs that were still in use and under observation for the entire study period (Table 2). A fracture of one maxillary 10-unit framework was recorded after 2 years of function, and the

[a]*Tutor, Department of Prosthodontics, Dental Clinic, School of Dentistry, University of Milan, Milan, Italy.*
[b]*Chairman, Department of Prosthodontics, Dental Clinic, School of Dentistry, University of Milan, Milan, Italy.*

***Correspondence to:*** *Diego Lops, Department of Prosthodontics, Dental Clinic, School of Dentistry, University of Milan, Via Beldiletto 1/3, 20142 Milano, Italy. Fax: 0250319040. Email: lops2@libero.it*

**Table 1** FPD Distribution at Study Initiation

| | Prosthesis | Crown | Abutment |
|---|---|---|---|
| **Maxilla** | | | |
| Anterior* | 16 | 77 | 50 |
| Posterior† | 5 | 13 | 10 |
| **Mandible** | | | |
| Anterior* | 2 | 14 | 9 |
| Posterior† | 5 | 19 | 13 |

*First premolar to contralateral first premolar.
†Distal from the first premolar.

**Table 2** FPD Distribution Throughout the Study Period

| | Prosthesis | Crown | Abutment |
|---|---|---|---|
| **Maxilla** | | | |
| Anterior* | 16 | 77 | 50 |
| Posterior† | 3 | 8 | 6 |
| **Mandible** | | | |
| Anterior* | 2 | 14 | 9 |
| Posterior† | 3 | 11 | 7 |

*First premolar to contralateral first premolar.
†Distal from the first premolar.

**Fig 1** Occlusal aspect before prosthetic rehabilitation on the maxillary right first and second molars.

**Fig 2** Occlusal aspect after tooth reduction.

**Fig 3** Occlusal aspect after luting of the FPD.

**Fig 4** Buccal aspect after luting of the FPD.

prosthesis was removed and replaced. The new zirconia 10-unit prosthesis was provided 1 month after, and it is still in use. One abutment tooth fracture was also recorded for a mandibular 4-unit framework after 2 years of function, and the prosthesis had to be removed. Following extraction of the fractured tooth root, an implant-supported restoration was provided. A minor chip-off material fracture was observed for one prosthesis. Possible occlusal causes for any one of the three recorded mishaps could not be accounted for. Two cases of retention loss occurred; recementation was performed using a resin-modified glass-ionomer cement (GC Fuji IX, GC) according to the manufacturer's instructions.

Life table analysis showed 6-year cumulative survival and success rates of 88.9% and 81.8%, respectively.

No significant difference was estimated between anterior and posterior prostheses ($\Sigma\chi^2 = 0.40$).

The McNemar test compared baseline PPD and BoP values with those recorded at the last control visit, and no significant difference was calculated for PPD ($\Sigma\chi^2 = 0.61$). Quite predictably, at the last control visit, mean BoP showed a better value than at baseline ($\Sigma\chi^2 = 42.2$).

## Conclusion

Clinical long-term evaluations are a critical requirement to conclude that zirconia FPDs have a viable future.[4–7] Within the limits of this paper's research design, the preliminary observations suggest optimistic clinical treatment outcomes since the observed prostheses were well tolerated and sufficiently resistant.

## References


1. Neumann LM, Christensen C, Cavanaugh C. Dental esthetic satisfaction in adults. J Am Dent Assoc 1989;118:565–570.
2. Ryge G. The California Dental Association quality evaluation system: A standard for self-assessment. In: Anusavice KJ (ed). Quality Evaluation of Dental Restorations: Criteria for Placement and Replacement. Chicago: Quintessence, 1989:273–290.
3. Durkalski VL, Palesch YY, Lipsitz SR, Rust PF. Analysis of clustered matched-pair data. Stat Med 2003;22:2417–2428.
4. Raigrodski AJ. Contemporary materials and technologies for all-ceramic fixed partial dentures: A review of the literature. J Prosthet Dent 2004;92:557–562.
5. Lüthy H, Filser F, Loeffel O, Schumacher M, Gauckler LJ, Hammerle CH. Strength and reliability of four-unit all-ceramic posterior bridges. Dent Mater 2005;21:930–937.
6. Tinschert J, Natt G, Mohrbotter N, Spiekermann H, Schulze KA. Lifetime of alumina- and zirconia ceramics used for crown and bridge restorations. J Biomed Mater Res Part B Appl Biomater 2007;80:317–321.
7. Conrad HJ, Seong WJ, Pesun IJ. Current ceramic materials and systems with clinical recommendations: A systematic review. J Prosthet Dent 2007;98:389–404.