

Framework Fracture of Zirconia Supported Full Arch Implant Rehabilitation: A Retrospective Evaluation of Cantilever Length and Distal Cross-Sectional Connection Area in 140 Patients Over an Up-To-7 Year Follow-Up Period

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Keywords

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Abstract

Purpose: To evaluate the relationship between different dimensional parameters in implant-supported monolithic zirconia fixed complete dental prostheses (IFCDPs) and the incidence of framework fracture in a large sample of cases in vivo.

Materials and Methods: This retrospective observational study evaluated all patients rehabilitated with screw-retained zirconia IFCDPs between January 2013 and April 2019 at a private practice. The minimum follow-up period was 1 year after occlusal loading. Fractures were classified as: *type I*—fractures that happened between but not involving the two most posterior screw-access openings (SAOs) and *type II*—fractures of the distal cantilever. Cantilever length, distal connector cross-sectional area, and screw access opening length were measured using data obtained from digital scans. Logistic regression was performed to evaluate the relationship between types I and II fractures and the independent variables (dimensional parameters). Using the receiver operating characteristic curves, two parameters were identified to be useful for establishing a cut-off and predicting type II fractures.

Results: A total of 180 prostheses delivered to 140 patients were analyzed. Five implants failed in three patients: three before delivery of the definitive prostheses and two after. Ten prostheses failed (5.6% prosthetic failure rate): 2 because of implant failures, and 8 because of framework fractures. Five fractures were classified as type I and three as type II. Significant associations were found between cantilever length and type I fractures (Wald = 5.772, df = 1, $p = 0.016$), distal connector cross-sectional area and type II fractures (Wald = 3.806, df = 1, $p = 0.051$), and cantilever length and the total number of fractures (Wald = 6.117, df = 1, $p = 0.013$).

Conclusion: Zirconia IFCDPs may be reliable medium-term solutions if some dimensional parameters are followed. The ratios between the cantilever length and cross-sectional connector area should be <0.51 , while the ratio between the cantilever length and screw access opening length should be <1.48 .

The long-term success of implant-supported fixed dental prostheses as a treatment option for full-arch rehabilitation is well-documented.^{1–10} New metal-free materials are becoming increasingly popular among clinicians for implant-supported fixed complete dental prostheses (IFCDPs); however, the scientific evidence is inconsistent. A recent systematic review¹¹ stated the low quality of available literature on metal-free material restorations on implants, and being unable to support or discourage their use over metal-ceramic or other types of

standard restorations, suggested that clinicians should continue to base their decisions on their own clinical experience. Another systematic review investigating multiple-unit implant-supported dental prostheses, concluded that metal-ceramic still remain the gold standard material.¹²

Wong et al reported the results of a review on the comparison between metal-ceramic and all-ceramic IFCDPs and were not able to compare the cumulative technical complication rate because studies of all-ceramic prostheses were few and with