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Fracture characteristics of anterior resin-bonded zirconia-fixed partial dentures.

Rosentritt M, **Ries S**, **Kolbeck C**, **Westphal M**, **Richter EJ**, **Handel G**.

Department of Prosthetic Dentistry, Regensburg University Medical Center, Regensburg, Germany, martin.rosentritt@klinik.uni-regensburg.de.

Resin-bonded fixed partial dentures (RBFPD) are used as a minimal invasive, tooth-preventing alternative for replacing anterior teeth. Zirconia cantilever restorations were supposed to show sufficient strength for a clinical application. The aim of this investigation was to determine the fracture characteristics of cantilever and two-retainer RBFPD, which are fabricated by computer-manufactured high-strength zirconia. Human incisors and canines were used to form three groups of 14 RBFPDs with different types of preparation: group 1, an invasive cantilever; group 2, a minimal-invasive cantilever and group 3, a two-retainer RBFPD control. After thermal cycling and mechanical loading, which was performed to simulate oral service, all restorations were loaded to fracture in a universal testing machine. One half of the specimens were investigated as a control without simulated service. Mode of failure was determined for the three designs. Both cantilever groups showed comparable fracture resistance of 227 N (no. 1) and 210 N (no. 2) before thermal cycling and mechanical loading. The resistance after aging was reduced to 210 N for the invasive cantilever RBFPD and to 179 N for the minimal invasive group. Three-unit RBFPDs showed a significantly higher ($p < 0.02$) fracture resistance than cantilever bridges before (426 N) as well as after aging (360 N). Predominant failure was FPD and retainer fracture for the invasive cantilever design, debonding for the minimal cantilever design and RBFPD fracture for the two-retainer design. The present study revealed a significantly higher fracture resistance for two-retainer RBFPDs than for cantilever RBFPDs. The frequency of adhesive debonding increased for non-retentive prepared cantilever RBFPDs.

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