1: Dent Mater. 2009 Mar;25(3):348-52. Epub 2008 Oct 1

Approach for valuating the influence of laboratory simulation.

Rosentritt M, **Behr M**, **van der Zel JM**, **Feilzer AJ**.

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

OBJECTIVE: The aim of this investigation was to determine the fracture resistance of zirconia fixed partial dentures (FPDs) after laboratory simulation. Failure type and failure rates during simulation were compared to available clinical data for estimating the relevance of the simulation. METHODS: 32 FPDs were fabricated of a zirconia ceramic and a corresponding ceramic veneer. The FPDs were adhesively bonded on human molars and artificial aging was performed for investigating the survival rate during thermal cycling and mechanical loading (TCML1; 3.6Mio x 50N ML). Survival rates were compared to available clinical data and the TCML parameter "mastication force" was adapted accordingly for a second TCML run (TCML2; 3.6Mio x 100N ML). The fracture resistance of the FPDs which survived TCML was determined. FPDs were examined without TCML (control) or after TCML according to literature (1.2Mio x 50N ML). Data were statistically analyzed (Mann-Whitney U-test) and curve fitting/regression analysis of the survival rates was performed. RESULTS: TCML reduced survival rates down to 63%. Failures during TCML were chipping off of the veneering ceramic, no zirconia framework was damaged. Under clinical conditions comparable failures (chipping) are reported. The clinical survival rate (approximately 10%) is lower compared to TCML data because of the short period of observation. The fracture resistance after TCML was significantly reduced from 1058N (control) to values between 320 and 533N. CONCLUSION: The results indicate that TCML with 1.2Mio x 50N provides a sufficient explanatory power. TCML with prolonged simulation time may allow the definition of a mathematical model for estimating future survival rates.