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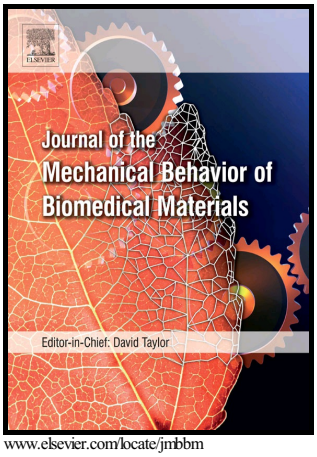

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Fracture strength and probability of survival of narrow and extreme-narrow dental implants after fatigue testing: *in vitro* and *in silico* analysis.

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Abstract

Purpose:

To assess the probability of survival (reliability) and failure modes of narrow implants with different diameters.

Materials and Methods:

For fatigue testing, 42 implants with the same macrogeometry and internal conical connection were divided, according to diameter, as follows: narrow (Ø3.3 x 10mm) and extra-narrow (Ø2.9x10mm) (21 per group). Identical abutments were torqued to the implants and standardized maxillary incisor crowns were cemented and subjected to step-stress accelerated life testing (SSALT) in water. The use-level probability Weibull curves, and reliability for a mission of 50,000 and 100,000 cycles at 50 N, 100, 150 and 180 N were calculated. For the finite element analysis (FEA), two virtual models, simulating the samples tested in fatigue, were constructed. Loading at 50 N and 100 N were applied 30° off-axis at the crown. The von-Mises stress was calculated for implant and abutment.

Results:

The beta (β) values were: 0.67 for narrow and 1.32 for extra-narrow implants, indicating that failure rates did not increase with fatigue in the former, but more likely were associated with damage accumulation and wear-out failures in the latter. Both groups showed high reliability (up to 97.5%) at 50 and 100N. A decreased reliability was observed for both groups at 150 and 180 N (ranging from 0 to 82.3%), but no

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