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Title: An in vitro comparative study on cyclic fatigue resistance of abutment screws in screw-retained and cement-retained long single molar crowns

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Abstract: Purpose: The present study was conducted to assess the cyclic fatigue resistance of implant-supported long single crowns and the effect of retention type on their mechanical behavior. The investigation aimed at evaluating failure modes and fracture resistance under conditions simulating mastication. Materials and Methods: Thirty implant-supported crowns were made, out of which 15 were screw-retained and 15 were cement-retained implant prostheses. The samples were tested on cyclic fatigue loading in a universal testing machine using physiological masticatory forces. The test method adhered to ISO 14801 guidelines, where cyclic loading at 275 N was used at a frequency of 5 Hz until failure or up to 5 million cycles. Fractographic analysis was carried out using FESEM. Statistical analysis was done using the independent t-test for fatigue resistance between groups. Results: Screw-retained prostheses demonstrated a greater mean number of cycles to screw fracture (105,430 cycles) than cement-retained prostheses (87,039 cycles), and the difference was not statistically significant ($p = 0.503$). Screw-retained crowns demonstrated greater fatigue resistance at the expense of increased screw loosening. Cement-retained crowns demonstrated lower fatigue resistance but improved stability. Fractographic analysis verified fatigue fractures with characteristic failure modes between retention types. Conclusion: Screw-retained crowns and cement-retained crowns have statistically insignificant differences in fatigue resistance. Screw-retained crowns are subject to loosening of the screw, whereas cement-retained crowns are more stable. The choice of retention type should be based on mechanical performance and clinical retrievability.

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