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Influence of Antagonist Material on Fatigue and Fracture Resistance of Zirconia Crowns

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Abstract: Objective This study investigates the influence of the most commonly used indenter materials on fatigue survival and fracture resistance of zirconia crowns. Materials and Methods A total of 40 zirconia crowns were prepared using computer- aided design (CAD)/computer-aided manufacturing (CAM) technology: 30 crowns were divided into three experimental groups of 10 specimens and the last 10 specimens acted as the control group. The experimental groups were subjected to chewing simulation with simultaneous thermocycling. Three indenter materials (steatite ceramic, stainless steel, and tungsten carbide) with identical diameter were used to load the specimens. All crowns were then subjected to single load to fracture test in universal testing machine. Load was applied vertically with a crosshead speed of 1 mm/min until failure, and fracture load was recorded. Statistical Analysis Normal distribution of data was confirmed using the Shapiro? Wilk test. Descriptive statistics including means and standard deviations were determined for all groups. Differences between groups were tested using Dunnett?s test and paired sample t-test. Results Chewing simulation for 1.2 million cycles resulted in 100% survival. The highest mean fracture load was recorded for the control group and the lowest one was for the group fatigued with stainless steel indenter. Chewing simulation statistically significantly ($p < 0.05$) reduced the mean fracture load of the crowns fatigued with stainless steel and steatite ceramic indenter. However, the mean fracture load for the crowns fatigued with tungsten carbide was not significantly different from that of the control group. Conclusion Steatite ceramic and stainless steel indenters produced close results and significantly reduced fracture load of zirconia crowns. However, tungsten carbide indenter caused nonsignificant reduction in the fracture load of zirconia crowns.