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Fractographic analysis of monolithic and bilayered zirconia after thermo-mechanical fatigue and fracture strength test

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Monolithic zirconia was developed to solve the bilayered zirconia dilemmas, such as chipping and delamination, and to achieve the greatest strength within the ceramic restoration. Fractographic analysis provides reliable facts about the fracture component in order to investigate the circumstances surrounding a failure event with the expectation of eventually explaining the cause of failure. So, the objective of this research was to study the fractographic analysis of monolithic and bilayered zirconia after thermo-mechanical fatigue and fracture strength test. A first upper premolar tooth was prepared and duplicated into epoxy resin die. Twenty-one crowns were fabricated and divided into three groups according to type of ceramic material; super high translucent monolithic zirconia group (A), super translucent monolithic zirconia group (B), and zirconia core with hand-layered veneering porcelain group (C). Crowns were cemented with self-adhesive resin cement. All samples were first subjected to thermal cycling (5°C-55°C/10,000 cycle) and then to chewing simulator (240,000 cycles, 50N). After fracture resistance test, fractographic method was used to analyze the fractured samples. The fracture origin of all studied groups was similar with crack origin located at occlusal surface (cone crack). Crack origins were indicated with mirror regions with appearing lines of hackle. The fracture origin was found to be dependent on the fracture resistance technique rather than the material itself.

Recent Publication

1. Scherrer SS, Lohbauer U, Bona AD, Vichi A, Tholey MJ, Kelly JR, Noort RV, Cesar PF. ADM guidance— ceramics: guidance to the use of fractography in failure analysis of brittle materials. Dent Mater. 33(6): 599-620.

2. Elgamma MA, Othman HI, Mohamed HR. Effect of two preparation designs and methods of construction on the fracture resistance of glass ceramic laminate veneers. Al-Azhar J Dent Sci. 21(4): 313-319.

3. Aqlan S, Elnaggar G, Kheiralla L. Fracture resistance of thin occlusal veneers made from hybrid ceramic (Cerasmart)- *in vitro* study. Al-Azhar J Dent Sci. 21(3): 293-297.

Biography

Abdulmuein Ahmad Alzhairi was master's graduate in conservative and esthetic dentistry, working on various new studies and continuously seek out knowledge and new techniques that allow him to remain aware and knowledgeable about new dental practices and technology. His mission is to enhance the research investigation in prosthodontics and to add to the body of knowledge of this valuable science.

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