Impact of surface finishes on the flexural strength and fracture toughness of In-Ceram Zirconia.

Dental restorations made of zirconia are usually selectively adjusted chairside to eliminate occlusal or internal interferences that can impair the mechanical properties of ceramic framework material. Effects of polishing procedures on zirconia after chipping or simply glazing the monolithic zirconia restorations are not known. This study evaluated the effects of different surface treatment procedures--namely, glazing or grinding, finishing, and polishing regimens--on the flexural strength and fracture toughness of a zirconia core material. Forty zirconia specimens were prepared and divided into two main groups (n = 20) according to the type of surface treatment (glazed or ground, finished, and polished). Each group was further divided into two subgroups (n = 10) according to type of mechanical test (flexural strength and fracture toughness). The roughness measurements were performed before mechanical testing. Qualitative evaluation of representative specimens of each subgroup was performed using SEM. The surface roughness mean (\(\bar{x}\) ± standard deviations) recorded for the glazed specimens (0.94 ±0.2) was significantly lower than that of the finished and polished group (3.01 ±0.1) (P < 0.05). The glazed zirconia showed significantly higher flexural strength (385.4 ±45.4 MPa) and fracture toughness (6.07 ±1 MPa.m\(^{3/2}\)) values than the ground, finished, polished zirconia (302.4 ±47.6 MPa and 2.14 ±0.5 MPa.m\(^{3/2}\)) (P = 0.002 and P < 0.001 for flexural strength and fracture toughness, respectively). A smooth topographic pattern after glazing could not be obtained after finishing and polishing. Grinding, finishing, and polishing markedly decreased the flexural strength and fracture toughness of zirconia compared to the glazed groups.

Immediate and delayed micro-tensile bond strength of different luting resin cements to different regional dentin

We sought to evaluate immediate and delayed micro-tensile bond strength of Panavia F2.0 and Multilink Sprint resin cement to superficial, deep and cervical dentin. Thirty-six freshly extracted non-caries human molars were sectioned in the mesiodistal direction to expose three different dentin regions including superficial dentin (1 mm below the dentine-enamel junction), deep dentin (1 mm above the highest pulp horn) and cervical dentin (0.5 mm above the cemento-enamel junction and 0.5 mm below the dentine-enamel junction). Resin cements were applied on dentin surfaces and composite blocks were luted under constant seating pressure. Each group was divided into three subgroups according to time intervals. Specimens were sectioned to obtain sticks of 1 mm in diameter and subjected to microtensile bond strength testing at a cross head speed of 1 mm/min. Both resin cements showed
higher micro-tensile bond strength to superficial dentin than that to deep or cervical dentin (P < 0.001). Micro-tensile bond strengths of Panavia F2.0 were higher than those of Multilink Sprint at different dentin regions (P < 0.001). Immediate micro-tensile bond strengths were higher than those of delayed micro-tensile bond strengths for both resin cements (P < 0.001). It was concluded that resin cements with different chemical formulations and applications yield significantly different micro-tensile bond strengths to different dentin regions.

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**Immediate and Delayed Micro-Tensile Bond Strength Of Different Luting Resin Cements To Different Regional Dentin**

**ABSTRACT**

**Purpose:** The purpose of this study was to evaluate immediate and delayed micro-tensile bond strength of Panavia F2 and Multilink sprint resin cement to superficial, deep and cervical dentin.

**Materials and Methods:** Thirty-six freshly extracted non-carious human molars were sectioned in mesiodistal direction to expose flat buccal and lingual halves exposing three different dentin regions superficial, deep and cervical. The resin cement (Panavia F2 and Multilink sprint) was applied on the dentin surface according to the manufacturers' direction and then composite block was luted under a constant seating pressure. The teeth were divided into two main groups according to resin cement used Group (1) Panavia F2.0 used. Group (2), Multilink Sprint used Each group divided into three subgroups: Subgroup A in which restored teeth were stored in distilled water at 37°C for 24 h then sectioned to obtain sticks 1 mm x 1 mm x 6 mm beams and tested for TBS to be tested in tension (0.5 mm/min) immediately. Subgroup B in which restored teeth will be stored in water for 6 months and then they sectioned and tested Subgroup C in which the teeth were stored in distilled water at 37°C for 24 h then vertically sectioned into sticks that were stored in distilled water for 6 months before testing. Each subgroup was divided into three divisions: Division (a) in which superficial dentin was exposed Division (b) in which deep dentin was exposed. Division (c) in which cervical dentin was exposed. All specimens were stressed to failure under tension using a universal testing machine at a cross head speed of 1mm / min.

**Results:** The result showed that micro-tensile bond strength to superficial dentin was significantly higher than to deep or cervical dentin for two resin cements. Micro-tensile bond strength of Panavia F2.0 significantly higher than Multilink Sprint. Immediate micro-tensile bond strength was significantly higher than delayed micro-tensile bond strength for two resin cements.

**Conclusions:** Luting resins with different chemical formulation and application yield significantly different bond strength to different regions in human dentin. Bonding to superficial dentin higher than deep and cervical dentin. Water plays an important role in resin-dentin bond degradation.
Influence of Fabrication Techniques and Artificial Aging on the Fracture Resistance of Different Cantilever Zirconia Fixed Dental Prostheses

Influence of fabrication techniques and artificial aging on the fracture resistance of different cantilever zirconia fixed dental prostheses

PURPOSE:
To evaluate the influence of dynamic fatigue on fracture load and failure mode of different types of adhesive zirconia restorations.

MATERIALS AND METHODS:
Eighty adhesive cantilever fixed dental prostheses (CFDP) were fabricated and assigned to four equal groups (n = 20) using the following materials and techniques. Group 1: machine copy-milling zirconia (Cercon), group 2: manual copy-milling technique (ZirkonZahn), group 3: slip casting technique (Vita In-ceram Zirconia), group 4: metal-ceramic CFDP. Specimens in groups 1 and 2 received selective infiltration-etching surface treatment, specimens in group 3 were acid etched with hydrofluoric acid and silanated, while those of group 4 were airborne particle abraded. All specimens were bonded with resin cement (Panavia F2.0) and thermocycled (5000 cycles/5 to 55°C). Then, half the number of the specimens of each group (n = 10) underwent dynamic loading (one million cycles at alternating loads between 10 and 40 N in a water bath at 37°C). All specimens were subjected to one-cycle loading to failure to evaluate fracture resistance. One-way and two-way ANOVA and Bonferroni post-hoc tests were used to analyze the data (0.05 = ±). The intaglio surfaces of fractured specimens were examined using stereomicroscopy and scanning electron microscope (SEM).

RESULTS:
Statistical analysis revealed that the failure load of metal (413 26 ± N) and machine copy-milled zirconia (368 24 ± N) restorations was significantly higher (F = 129, p < 0.001) than manually copy-milled (316 18 ±) and In-ceram zirconia (210 17 ±) restorations. Dynamic fatigue significantly (p < 0.03) reduced failure load of the manually copy-milled and In-ceram zirconia restorations, while metal and machine copy-milling zirconia restorations were not influenced by fatigue.

CONCLUSIONS:
The fatigue strength of adhesive zirconia restorations is influenced by cyclic loading and the technique used to manufacture these restorations.

Influence of thermal cycling and mechanical loading on the fracture strength of in-ceram zirconia anterior cantilever resin based fixed dental prostheses

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