

Reason for loosening of ceramic restorations



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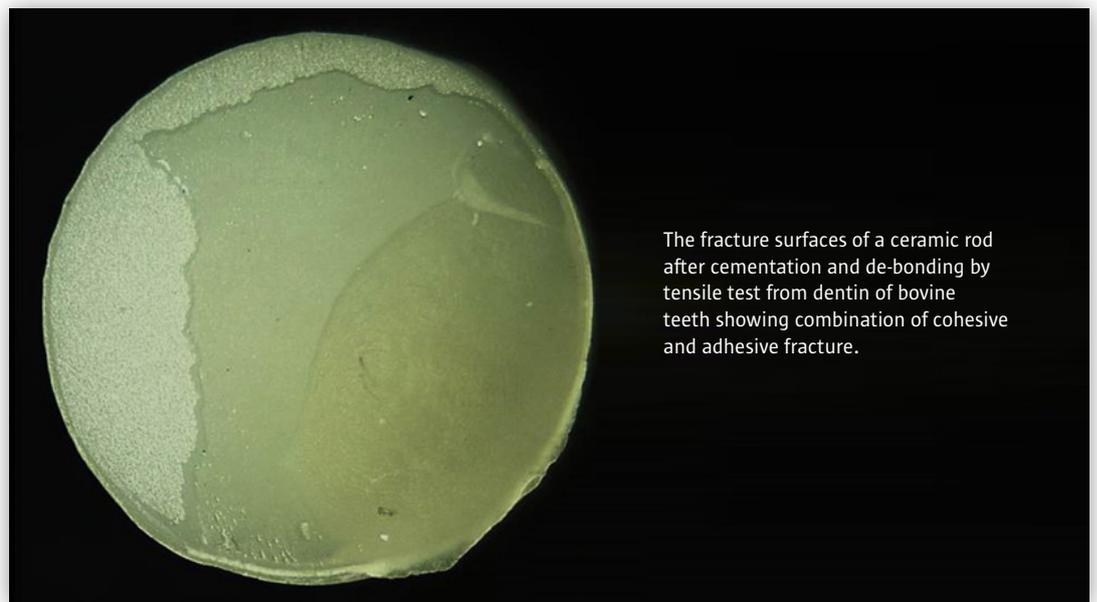
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The resin cement forms the weakest link for a ceramic restoration. This was found in an investigation of the de-bonding of resin cementation of zirconia or lithium di-silicate ceramic to bovine dentin. Bonding to the ceramic or to the dentin rarely failed. The experiments mimicked a clinical situation by aging the bonded materials before mechanical testing.

Rods of zirconia were either: 1) sandblasted or 2) melt-etched with potassium hydrogen-difluoride (KHF_2). Rods of glass ceramic reinforced with lithium di-silicate were etched with hydrogen fluoride (HF). Ten rods from each treatment were cemented to bovine dentin with each of five dual-cure resin cement products, i.e. 50 samples for each treatment group. All samples were thermo-cycled before the force required to break the bonding was measured.

The morphology of the de-bonded surfaces was examined in a stereo microscope and the de-bonding characterized as cohesive or adhesive or as a combination.

Cohesive de-bonding, that is fracture through the resin cement, occurred most frequently; combined adhesive-cohesive de-bonding was second most prevalent. No adhesive fractures were observed at the interface between resin cement and melt-etched zirconia surfaces. The surface treatments resulted significant differences in the roughness (Sa-values) of the ceramics measured with confocal microscope prior to bonding. However, the roughness seemed less important than the inherent strength of the cement in the bond between ceramics and bovine dentin.



The fracture surfaces of a ceramic rod after cementation and de-bonding by tensile test from dentin of bovine teeth showing combination of cohesive and adhesive fracture.

Read more:

Sagen MA, Kvam K, Ruyter EI, Rønold HJ. Debonding mechanism of zirconia and lithium disilicate resin cemented to dentin. Acta Biomater Odont Scand 2019 (<https://www.tandfonline.com/loi/iabo20>)

Acta Biomaterialia Odontologica Scandinavica, Volume 5, 2019.

The weakest link in cementation of glass ceramic and zirconia restorations to dentin was the resin cement.

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Peroxide-free tooth whitening

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Color change due to acid
erosion of tooth substance

The peroxide-free tooth whitening products are less effective than those based on peroxides and the effect is only transitory. Both peroxide-free and peroxide containing products gave an initial lightening of the tooth color. However, the effects of peroxide-free products were only transitory. The mechanisms of actions were different for the two product types. The lightening of the peroxide-free was due to acid erosion of the enamel surface changing the reflection of light. For the peroxide containing product the bleaching effect was caused by oxidation of chromophores in enamel and dentin.

Four peroxide-free tooth whiteners were purchased from internet and pharmacies, and one peroxide based product was distributed through a dental office. These products were tested using extracted teeth. The whitening processes were performed according to the manual of the different products. The teeth were examined in a standardized light box, and the tooth color was given according to the Vita Lumin-Vacuum colour scale.

The evaluations were done prior to the treatment, immediately after the whitening, and after eight months. After 8 months, no perceivable lightening was noted for the peroxide-free products whereas the teeth treated with peroxide containing bleaching remained lightened.

Clinical implication

The peroxide-free tooth whitening products is not recommended for persistent lightening of stained teeth. Repeated use of such acidic products may damage the enamel, amorphous materials, like glass and polymer materials. Therefore this instrument is also suitable for determining the same parameters for polymer materials.

Transitory lightening caused
by peroxide-free products



Read more:

Møller EL, Lien OB, Dahl JE. Peroxide-free tooth whitening products. *Nor Tannlegeforen Tid.* 2018; 128: 772–7.