Celtra® Duo

Zirconia-Reinforced Lithium Silicate (ZLS) Block

Clinical Evaluation Summaries

Wear, strength, modulus and hardness of CAD/CAM restorative materials

Lawson NC, Bansal R, Burgess JO. *Dent Mater.* 2016 Nov;32(11):e275-e283. doi: 10.1016/j.dental.2016.08.222. Epub 2016 Sep 14.

Objective of Study

Measure the mechanical properties of several CAD/CAM materials.

Key Finding / Analysis

Properties were different for each material ($p<0.01$). In general, e.max® CAD® and Celtra® Duo (ZLS) were stronger, stiffer, and harder than the other materials. e.max CAD, Celtra Duo (ZLS), Enamic®, and enamel demonstrated signs of abrasive wear, whereas CERASMART™, Lava™ Ultimate, Paradigm™ MZ100 demonstrated signs of fatigue.

Conclusion

Overall, the "hybrid" materials (CERASMART, Lava Ultimate, Paradigm MZ100, and Enamic) had a lower flexural strength than the glass ceramics [e.max CAD and Celtra Duo (ZLS)]; the resin composites had a lower elastic modulus and hardness than the infiltrated ceramic, which in turn had a lower elastic modulus and hardness than the glass ceramics.

Fracture toughness of chairside CAD/CAM materials— Alternative loading approach for compact tension test

R Badawy, O El-Mowafy, LE Tam, *Dent Mater.* 2016 Jul;32(7):847-52. doi: 10.1016/j.dental.2016.03.003. Epub 2016 Apr 28.

Objective of Study

Determine plane-strain fracture toughness (K_{IC}) of five different chairside CAD/CAM materials used for crown fabrication, following alternative innovative loading approach of compact test specimens.

Key Finding / Analysis

Highest K_{IC} values were recorded for fired/crystallized glass-ceramic materials [Celtra Duo (ZLS)/e.max, respectively] and glass-ceramic materials without firing or crystallization were associated with significantly lower mean K_{IC} compared to their fired/crystallized counterparts.

Conclusion

Celtra Duo (ZLS) was tested in both fired and unfired conditions to determine the effect of firing on K_{IC}. The significantly higher K_{IC} values ($p < 0.01$) recorded for fired Celtra Duo (ZLS) compared to non-fired specimens and may be due to crack-healing processes that may have occurred to existing surface microcracks after heat application.

Stability of endodontically treated teeth with differently invasive restorations: Adhesive vs. non-adhesive cusp stabilization

R Frankenberger, I Zeilinger, M Krech, et al., *Dent Mater.* 2015 Nov;31(11):1312-20. doi: 10.1016/j.dental.2015.08.160. Epub 2015 Sep 26.

Objective of Study

Evaluate fracture strength of endodontically treated molars with different preparations/restorations after the thermomechanical loading in vitro.

Key Finding / Analysis

For MOD preparations, statistically higher fracture strengths were recorded for all groups except IPS Empress® CAD ($p > 0.05$). The results of partial crowns made of e.max CAD, Celtra Duo (ZLS), Lava Ultimate, and Enamic showed fracture strengths being almost comparable to the control teeth without restoration and comparable to each other ($p > 0.05$).

Conclusion

Within the limits of this in vitro approach, it can be concluded that cuspal coverage is generally desirable for the restoration of endodontically treated teeth beyond a certain cavity extension. Newer polymer and ceramic materials as partial crowns outperformed older ceramics, such as IPS Empress.

Translucency of esthetic dental restorative CAD/CAM materials and composite resins with respect to thickness and surface roughness

D Awad, B Stawarczyk, A Liebermann, et al., *J Prosthet Dent.* 2015 Jun;113(6):534-40. doi: 10.1016/j.prosdent.2014.12.003. Epub 2015 Mar 4.

Objective of Study

Evaluate the translucency of restorative CAD/CAM materials and direct composite resins with respect to thickness and surface roughness.

Key Finding / Analysis

The effect of all tested parameters was significant among the tried materials (P < .05): Celtra® Duo (ZLS), IPS e.max®, IPS Empress®, Lava™ Ultimate, Telio CAD, VITA CAD Temp®, VITA Enamic®, VITA Mark II, TEC® BulkFill, TEC® A2, and Filtek™ Supreme XTE. The greatest influence on the measured translucency was thickness (partial eta squared ηP2 = .988), closely followed by material (.982), and the pretreatment method (.835). The surface roughness was strongly influenced by the pretreatment method (.975) and type of material (.941).

Conclusion

Celtra Duo (ZLS) is a new class of ceramic, which is called zirconia-reinforced lithium silicate. The inclusion of 10% zirconia dissolved into the lithium silicate glass matrix results in 4 times smaller silicate crystals, implying a high glass content and higher translucency than conventional LiSi2 ceramics [Celtra Duo (ZLS); DeguDent GmbH]. In fact, Celtra Duo (ZLS) attained higher T% values than IPS e.max CAD, but only in the case of a polished surface.

Adhesive luting of new CAD/CAM materials

R Frankenberger, VE Hartmann, M Krech, et al., *Int J Comput Dent.* 2015;18(1):9-20. English, German.

Objective of Study

Evaluate the adhesive bonding performance of recently introduced tooth-colored CAD/CAM materials after different pretreatment protocols and using different luting materials.

Key Finding / Analysis

Despite the differences found, all materials showed a high level of bonding performance, being sufficient to withstand intraoral chewing forces during mastication. However, for Calibra®, statistical subgroups of best performing groups were Celtra Duo (ZLS) > e.max CAD > Enamic > Lava Ultimate (P < 0.05), and for RelyX™ Unicem, statistical subgroups of best performing groups were Celtra Duo (ZLS) = e.max CAD > Enamic > Lava Ultimate (P < 0.05).

Conclusion

Under application of the recommended pretreatment protocols, the novel CAD/CAM materials show promising, bonding performances to different types of luting resin composites.

Microtensile Bond Strength of Lithium Disilicate Ceramics to Resin Adhesives

MN Aboushelib, D Sleen, *J Adhes Dent.* 2014 Dec;16(6):547-52. doi: 10.3290/j.jad.a33249.

Objective of Study

Evaluate the influence of the internal structure of lithium disilicate glass ceramics (LDC) on the microtensile bond strength to a resin adhesive using two surface treatments.

Key Finding / Analysis

Statistical analysis revealed significant differences in microtensile bond strength values between different LDCs (F = 67, p < 0.001), different surface treatments (F = 232, p < 0.001), and interaction between LDC and surface treatments (F = 67, p < 0.001). Specifically, microtensile bond strength of Celtra Duo (ZLS) ceramic (30.4 3 4.6 MPa) was significantly higher than both IPS Empress® 2 (21.5 3 5.9 MPa) and IPS e.max ceramics (25.7 3 4.8 MPa), which had almost comparable MTBS values.

Conclusion

Within the limitations of this study, bond strength to lithium disilicate ceramics depends on proper surface treatment and on the chemical composition of the glass ceramic.