FULLY CRYSTALIZED VERSUS PARTIALLY CRYSTALIZED LITHIUM DISILICATE CAD/CAM BLOCKS

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Introduction

Lithium disilicate is favored by most dentists over other esthetic materials due to its superb esthetic outcomes, satisfactory strength, and prolonged survival rates [1,2]. IPS EmaxCAD has served for years as the milestone for CAD/CAM esthetic restorative treatment. Due to its relatively high strength, lithium disilicate was always milled in a pre-sintered intermediate phase which necessitates a second firing procedure in a special furnace. Recently, new fully crystallized lithium disilicate blocks which require no additional firing step were introduced. However, the risk that hard milling would induce the formation of intrinsic flaws and negatively affects the long-term strength and abrasiveness of the final restoration is still questionable.

Methods

Rectangular shaped specimens were sectioned from LiSiCAD (n=20) and EmaxCAD blocks (n=10). The LiSiCAD were divided into: Polished; LiSiCAD-P (n=10) or Glazed; LiSiCAD-G (n=10). EmaxCAD specimens were subjected to combined firing/glazing cycle following the manufacturer's recommendations. Specimens were subjected to 200,000 wear cycles at 20N force and 2mm sliding distance against natural premolars. Micro-CT was used to get pre and post scans for the teeth and volumetric enamel loss was calculated through scans overlapping (Figure 1). Ceramic wear was calculated based on weight loss. For fracture resistance test, full contour crowns of uniform thickness were milled from the tested blocks, then finished and sorted as previously described (n=20) then adhesively cemented to duplicated epoxy dies. Half of specimens (n=10) were aged in a chewing simulator, then both aged and non-aged specimens were subjected to static loading until fracture. Data were statistical analysed using One-way and Two-way ANOVAs and equivalent test for non-parametric results. The significance level was set at $P \leq 0.05$.

Results

LiSiCAD-P specimens had significantly lower mean ceramic wear values after 100,000 and 200,000 wear cycles (0.780±0.192 & 1.04±0.222 respectively) than EmaxCAD and LiSiCAD-G. No significant differences in volumetric enamel loss were seen between groups. Aging did not significantly affect the fracture resistance of any of the tested groups. EmaxCAD demonstrated the highest mean fracture load (1600±195). LiSiCAD-P and LiSiCAD-G were fractured at similar loads (990±222 & 915±262, respectively).

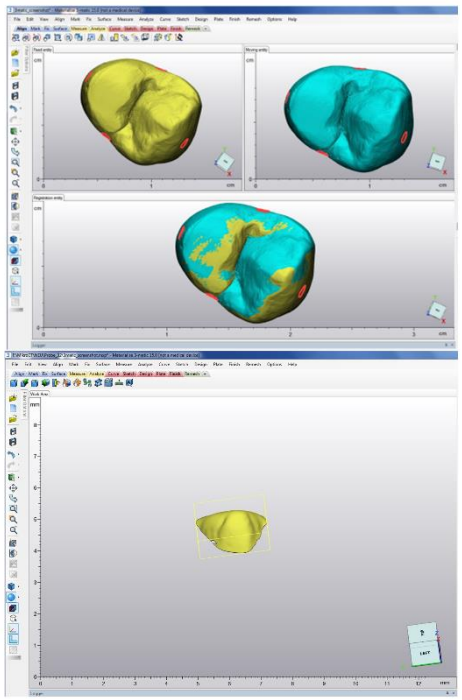

Figure 1: Overlapping of pre- and post wear test tooth models on 3-Matic software (Materialise, Belgium). Boolean subtraction is used to define the worn area.

Conclusion

EmaxCAD and LiSiCAD produce similar enamel wear rates which fall within the acceptable physiological wear rate. Polished LiSiCAD is more wear resistant than EmaxCAD or glazed LiSiCAD. LiSiCAD is less fracture resistant than EmaxCAD. Aging has no effect on the fracture resistance of any of the tested materials. Glazing did not improve the properties of LiSiCAD.

References

1. Makhija, S.K., et al, J Dent, 2016. 55: p. 40-47.

2. Conejo, J., et al, Current Oral Health Reports, 2017. 4(2): p. 112-123.