Title: Achieving the Desired Esthetic with Current CAD-CAM Ceramics

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Abstract

The demand for tooth-colored restoration has grown considerably during the last decade. The restoration of anterior teeth is a difficult task, even for an experienced operator. Color is the most important determinant of esthetics. This requires that the optical properties of the restorative material be similar to that of the natural teeth. Thus, for an acceptable esthetic result, favorable shade matching of the all-ceramic restoration should be achieved by controlling absorption, reflection and transmission of dental ceramic material. Currently there are many different ceramic systems that can be used to achieve highly esthetic results. These include metal-ceramics with porcelain margins, In-Ceram, Hi-Ceram, IPS-Empress, Optec, and CAD/CAM ceramics. All ceramic systems have different composition, microstructure, crystalline content and phases. Direct transmittance, translucency, opacity and opalescence, all influence the optical properties of the ceramic restoration. Other factors include the thickness of ceramic, number of firing, glazing, powder/liquid ratio, surface texture and even the resin shade.

Background

This article focuses on controlling all influence the optical properties of the ceramic restoration variables to achieve the best possible esthetic result with an all ceramic system with the emphasis on CAD CAM systems.

Methods

Through searching PubMed and Google scholar search engines ،the search results leads us to the following selected studies gathered in table and explained in detail.

The perceived color of a ceramic restoration is known to be affected By:

- type of ceramic substructure
- shade of the ceramic material
- Translucency
- thickness
- surface texture
- powder/liquid ratio
- Ceramic firing temperature
- surface glaze
- layering extrinsic colorants

CAD/CAM all-ceramic biomaterials:

❑**CAD/CAM glass ceramics**

- CAD/CAM-compatible feldspathic ceramics
- CAD/CAM and mica-based ceramics
- CAD/CAM with leucite-reinforced ceramics
- CAD/CAM milling lithium disilicate reinforced ceramics
- CAD/CAM and glass infiltrated alumina and zirconia ceramics

Optical properties of ceramics:

- chemical composition
- atomic structure
- fabrication process
- microstructure
- The relative amount, nature, shape and particle size distribution of the crystalline phase(s)
- porosity

Results

The microstructure of CAD–CAM ceramic systems influenced the optical properties. There are important relationships between chemical composition, atomic structure, fabrication process, microstructure and properties of dental ceramics. The relative amount, nature, shape and particle size distribution of the crystalline phase(s) and porosity directly influence the mechanical and optical properties of ceramic.

CAD/CAM-compatible feldspathic ceramics :Feldspathic ceramics may be bonded to tooth tissues using a combination of airborne particle abrasion (50 mm Al2O3), followed by etching with hydrofluoric acid (HF) and the use of a silane coupling agent which is used to bond dissimilar materials.

CAD/CAM and mica-based ceramic : is Low clinical performance , the materials are no longer in the market.

CAD/CAM with leucite-reinforced ceramic : is a leucite reinforced ceramic, similar in structure to the heat pressed ceramic Empress, The marginal gap, internal fit and fracture load also compared favorably with Empress. It was developed for chair-side single unit restorations. has a flexural strength of about 160 Mpa,Clinically it is recommended for single tooth restorations.

CAD/CAM milling lithium disilicate reinforced ceramic: IPSTM e.max CAD (2006) and is a chair-side monolithic restorative material. The blue ceramic contains metasilicate and lithium disilicate nuclei . at 850 8C in vacuum for 20–25 min. During this heat treatment, the metasilicates are dissolved, lithium disilicate crystallizes and the ceramic is glazed at the same time.

CAD/CAM and glass infiltrated alumina and zirconia ceramic:The VitaTM InCeram Classic group of ceramics (InCeramTM Alumina, Spinell and Zirconia are slip cast, glass infiltrated ceramics. can also be fabricated by CAD/CAM machination. The blocks are manufactured by dry pressing the ceramic powder into a mould and compacted until the open pore microstructure is reached. The number of macro-pores is lower but more homogenous as compared to slip-casting technique.After the substructure is milled, veneering composite is applied for characterization. The material is then sintered and infiltrated by La-glass.

Conclusion

Focuses on controlling these variables to achieve the best possible esthetic result. High strength ceramics have been developed as the core/framework material for all-ceramic restorations because of their improved esthetics and the eventual biological incompatibility risks of metals used for conventional porcelain-fused to metal restorations Because of the improved mechanical properties, especially flexural strength and fracture toughness Fractures of ceramic FPDs tended to occur in the connector areas because of the concentrated stress. Therefore, the design of the connector, particularly the dimensions, must be made independently depending on the type of ceramic material used for the framework.

Reference

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There are more reference because lack of space refuse to mention it .