بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / سلوي محمود عقل

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى

مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد

Translucency of different pressable lithium silicate ceramics with two thicknesses
- An in vitro study -

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بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

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Dedication

This work is dedicated to those who made it possible…

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Introduction

Ceramic Restoration have gained Fame and are now applied in daily practice[1]. Their esthetics, durability, and biocompatibility have made them useable as an option for the restoration of anterior teeth[2]. Their use which has been considered just an aesthetic treatment, has recently expanded, mainly due to the superior Optical properties of new glass ceramics and to the improvement of the cementation strategies. Porcelain laminate veneers of minimum thickness provide satisfactory esthetic results and biocompatibility[3]. Indeed, some points should be considered to obtain success in the case planning, type of preparation, selection of materials, and the continued maintenance of the restorations.

Successful porcelain laminate veneers depend on factors such as mechanical strength, bonding properties[4].

A new addition to the lithium ceramic family is lithium silicate ceramic with the same basic components but with the new addition of 7.6% germanium dioxide improving properties like castability, thermal expansion and refractive index, and increasing the final density, resulting in a higher mechanical properties.

Recently, 10% by weight zirconia has been added to lithium silicate ceramic (referred to as zirconia reinforced lithium silicate or ZLS) offering “a homogeneous, fine crystalline structure with an average crystal size of 0.5 µm compared to the needle-shaped crystals with an average size of 1.5 µm found in the lithium disilicate ceramic.”

Currently, fixed dental prostheses (FDPs) of lithium-silicate (LD) ceramic have been recognized as an excellent option for dental rehabilitation, being indicated for manufacturing anterior and posterior monolithic crowns [5]. There are two completely distinct protocols recommended regarding available processing techniques for their manufacture: one technique that is based on high vacuum injection, where ceramic ingots are pressed into a waxed crown inclusion in a special cast investment through the lost wax technique; and another based on the current principles of digital dentistry using CAD/CAM (Computer Aided Design/Computer Aided Machining) systems, which presents advantages of high precision, efficiency, and accuracy which have reduced processing time.[6]

Clinicians and Patients are nowadays seeking esthetics with restorations of Shade, Shape and Translucency close to that of natural teeth.

The translucency of dental ceramics is complex, and many variables contribute the final appearance produced. Illuminant wavelength alters translucency; the higher the wavelength, the more translucent a material appears. Material thickness is another factor that affects the translucency.[7]

Lim et al. calculated the translucency parameters (TP) of core, veneer and layered ceramics by using spectrophotometer (SP) measurements and spectroradiometer (SR) measurements. The authors suggested that color-measuring mechanisms for both SR and SP measurements appear to be similar. The SR-based TP values were higher than those measured by the SP.[8]

Yuan et al, 2013 studied the effect of zircon-based tricolor pigments on the mechanical and optical properties of lithium disilicate glass ceramics and founded that's no effect of pigments on mechanical properties (ex. Flexural strength) of lithium disilicate glass ceramics but it has a great effect on other optical properties. [9]

Santos et al, 2015 worked on different levels of translucency, opacity and shade of ingots but they did not affect their mechanical strength, and the use of these ceramics should be guided by the esthetic demands of each clinical situation.[10]

Review of Literature

Dental esthetics has become highly important in recent years. Meeting esthetic demands with noninvasive or minimally invasive techniques can preserve the natural tissues. The development of adhesive resin cementation technique and laminate veneer applications, among other minimally invasive treatments, have gained importance due to greater protection rates of the tooth and high esthetic standards.(11)

Dental Ceramics:

Recent improvements in esthetic dentistry led to the development of innovative ceramic materials with better mechanical, physical and optical properties.(12)

Various glass-ceramic materials have been promoted and introduced in dentistry, associated with the evolution of novel processing technologies. These lead to an essential change in the clinical and technical workflow, along with the changes in treating patients. The trend towards achieving monolithic restorations is related to the chipping or delamination behavior of multilayered aesthetic restorations.(13)

Ceramics can vary from being very translucent to very opaque. In general, the glassier the microstructure (non-crystalline), the more translucent the ceramic will appear; the more crystalline, the more opaque. Other contributory factors to translucency include particle size, particle density, refractive index, and porosity.(14)

The term glass-ceramics is defined by one glassy amorphous phase into which crystals are precipitated in a controlled manner by nucleation and crystal growth. The controlled precipitation of the crystalline phases (by temperature and time) permits us to overcome some of the glass deficiencies. Controlled crystallization of glasses is known to positively impact dental ceramic materials mechanical properties. Nanostructures can be adapted to confer excellent properties, related both to the surface and their inner structure. It is well known that the surface roughness has a substantial influence on the clinical behavior of the restorations.(15)

Glass-ceramics can be used from veneers to full anatomic restorations, according to ISO 6872. The materials requirements specified in this standard, associated with aesthetics, are decisive for the selection of the material. Due to the high demand for monolithic aesthetic restorations, high strength materials have been developed in this category, having appropriate optical properties. Lithium disilicate glass-ceramics are extensively used in practice. In this class of materials, the interlocking microstructure together with a high content of crystalline phase (60–70 vol.%), formed by the lath-like Li2Si2O5 crystals, is the basis for the high strength (400–610 MPa) and toughness (2.3–2.9 MPa) of the material.(16)

The crystallization of the lithium disilicate is controlled by a heating cycle, in which lithium metasilicate (Li2SiO3) reacts with the glassy phase (SiO2) to originate lithium disilicate (Li2Si2O5). The excellent mechanical properties are a result of decreasing in the size of the platelet-shaped crystals (length of 2000–3000 nm) and of increasing in interlocking among crystals.(17)