INFLUENCE OF LIGHT- CURING MODE AND SYSTEM ON THE MICROHARDNESS OF LIGHT- CURED RESIN CEMENT UNDER TWO DIFFERENT CERAMIC LAMINATE VENEERS

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Introduction

The evolution of the esthetic movement has been sustained over time because it touches a basic psychological need for most people to feel that they are attractive, youthful, and a vital part of society. So, the ability of the dental professional to improve the patient's smile has become a benchmark in modern esthetic dentistry.

As esthetics are attaining increased role in our modern society, porcelain laminate veneers consequently are acquiring increased popularity at the recent years. This mainly is due to their conservative technique and fascinating esthetic outcome.

The development of light curing resin cements provides superior esthetic outcome, controlled working technique, and superior mechanical properties, and their use in bonding of laminates is proceeding at a very ascending rate.

In the approximately 25 years that dental restorative resins have been cured by light, there has been constant evolution and improvement in the curing devices and the resins they cure. During the past decade, curing lights have become very effective. Dentists who have functional halogen, fast halogen or plasma arc lights may wish to compare their current lights with the new generation of LED (Light Emitting Diode) lights that are dominating the commercial dental advertising at this time.

Due to the need for improved physical properties of resin based composites and less stress at the marginal interface, light curing units experienced significant advances in the past years. As a result the dentist can now choose from a vast variety of curing lights QTH (Quartz Tungsten Halogen), LED, PAC (Plasma Arc), and LASER, light intensities and curing modes (standard, soft start).

One of the most annoying factors regarding the conventional light curing techniques is the increased time factor to attain maximum degree of conversion of the adhesive material. However, with the introduction of the new curing systems, the time factor has been reduced to minimum. The question arises is: Have the luting material attained its maximum hardness under the new light curing systems as that attained under the conventional Halogen lamps?

The exciting introduction of the IPS EMPRESS-ESTHETIC material, allowed the use of the pressable ceramic with their improved esthetic and mechanical properties within the porcelain laminates. So, it is very interesting to study the effect of its composition on the resultant hardness of the underlying light cured resin cement.

The effect of the curing system and mode, as well as, the ceramic type on the microhardness of the light - cured resin cement under ceramic laminate veneers was the main concern of this study.

Review of literature

The ability of the dental professional to improve the patient's smile has become very important in modern esthetic dentistry. [122] The use of porcelain laminate veneers plays an important role in the solution of many esthetic and functional problems. At the moment, it is the alternative treatment to solve some cases with the least dental reduction, the highest fitting and a low cost. [28, 29, 32, 47, 85, 103]

Laminate veneering is a conservative method of restoring the appearance of discolored, pitted, fractured, or malformed anterior teeth with minimal chair time and excellent esthetics without restoring to full coverage crown. It consists of bonding thin ceramic laminates onto the labial surfaces of the affected teeth (may include incisal and part of lingual surfaces). The bonding procedure is the same as that for ceramic inlays except that a photopolymerize luting resin is usually used. [20, 23, 27, 34, 44, 68, 88, 131, 139]

The reduction of the enamel on the labial surface for Custom-made veneers of permanent anterior teeth provide a superior functional and, more importantly, physiological result while still offering a conservative type of treatment. The uniqueness of the technique is in its ability to restore the physiological relationship of the gingiva and the labial surface, rather than to compromise this relationship by making a bulbous tooth of a greater labiolingual dimension than a normal tooth. [25, 36, 138]

On account of the low laminate thickness very little enamel preparation is needed. The residual enamel mass and the translucency of the ceramic material produce a natural appearance and optimal cosmetic results. [17, 37, 101, 141]

Lim CC. [81] **(1995)** mentioned that the options for correction of unesthetic teeth are numerous; among these treatments, porcelain veneers have received substantial attention from the profession and patients. The increase in dental health awareness and advances in dental materials and technology, such as the acid-etching technique, improved physical properties of composite luting resin, and the use of silane coupling agents, has contributed to the success ceramic veneers enjoy today.

The main advantage of laminate veneers is the conservation of tooth structure. Typically, only about 0.5 mm of facial reduction is needed. Because this is confined to the enamel, local anesthesia is not usually required. So the etched-porcelain veneers can provide a restoration that looks natural with a minimum of tooth preparation. It´s application has been equally successful on mandibular and maxillary teeth. Periodontal response to the veneers, when properly placed, has been excellent. As a conclusion properly performed, porcelain veneers can provide outstanding esthetics, strength, and longevity. [3, 6, 38, 53, 54, 78, 92, 105, 117]

After usage of laminate veneers no significant differences were found in proteolytic enzyme activity or gingival index. There were reductions in plaque index and plaque bacteria vitality. [56, 71] The low fracture and debond rate combined with no incidence of caries seem to indicate that these restorations are functioning satisfactorily and with minimal negative periodontal response. [16]

For many restorations esthetic results are critically important. In this regard the restorative material should maintain its surface quality and esthetic characteristics over an extended period of time, preferably for the lifetime of the patient. Dental ceramics are attractive because of their biocompatibility, long-term color stability, wear resistance, and their ability to be formed into precise shapes.[107]

Garber DA. and Adar P. [55] **(1997)** mentioned that porcelain veneer restorations could be utilized to accurately alter and correct occlusal relationships, and the less abrasive surface of the material offered a distinct advantage in occlusal modifications, such as altering cuspal guidance or vertical dimension.

One of the methods of strengthening ceramics is to reinforce them with a dispersed phase of a different material that is capable of hindering a crack from propagating through the material. This process is referred to as dispersion strengthening. Almost all of the newer higher-strength ceramics derive their improved fracture resistance from the crack-blocking ability of the crystalline particles. Dental ceramics containing primarily a glass phase can be strengthened by increasing the crystal content of leucite (K2O 'A12O3 -4SiO2). [48, 107]

A crystalline phase with greater thermal expansion coefficient than the matrix produces tangential compressive stress (and radial tension) near the crystal-matrix interface. Such tangential stresses tend to divert the crack around the particle. Leucite particles have greater thermal expansion coefficient than dose the surrounding glassy matrix. Upon cooling, compressive stresses develop at the leucite crystal-matrix interface. [117]

New generations of ceramics along with the current adhesive techniques have resulted in the ability to provide higher strength restorations. [57] Since the late 1980s, a leucite-reinforced pressed-glass ceramic (IPS Empress) has been utilized in the anterior region for full crowns and veneers, which provided a unique combination of strength, translucency, and natural light transmission qualities , as well as, vitality that resemble the characteristics of natural teeth. Its vitality is further enhanced by an adhesive resin cementation method that conducts the color of the underlying tooth structure. [125]Also provide patients with a proven esthetic and functional restoration that exhibits wear-compatibility, durability, and marginal integrity. [52, 61, 132]

The cast glass ceramic veneers exhibit properties that make them extremely useful for this dental application. They have a hardness, abrasion resistance, coefficient of thermal expansion, and translucency similar to that of enamel. The use of the lost wax casting technique to provide precise anatomic form and margins allows for increased accuracy during veneer fabrication. Chairside time requirements may be decreased as a result of the improved accuracy inherent in the lost wax casting technique. [75]

Lehner CR. and Scharer P. [76] **(1992)** mentioned that the recently introduced with pleasing esthetic qualities, IPS-Empress, a European leucite-reinforced glass-ceramic, has finally drawn attention in and has been reviewed with promising in vitro test results. Using a simple press-molding technique, well-fitting crowns, inlays, and veneers can be fabricated without an additional ceramming procedure.