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In vitro study: Luminosity of Lithium Disilicate Ceramic

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ABSTRACT: This study aims to evaluate the luminosity of lithium disilicate.A resin maxillary left central incisor typodont received a laminate veneer preparation. The ceramic laminate veneers were fabricated from IPS e.max CAD(IvoclarVivadent). The ceramic laminate veneers were cemented by Rely X Veneer (3M ESPE). The color measurement of the veneered abutment was performed after 24 hours and calculated through Spectrophotometric reflection apparatus (UV- Shimadzu 3101 PC, Agilent Technologies Inc). The specimens were exposed to aging, then remeasured.The mean L* value decreased from 96.69± 0.43 to 74.28± 0.38 after aging.It was concluded that the luminosity of ceramic laminate veneer is decreased by aging.

KEYWORDS:luminosity, lithium disilicate, ceramic veneer.

I. INTRODUCTION

The desire for an elegant smile is propagated as a primary esthetic demand in the last few decades.
[1].The ceramic laminate veneer is used to modify the shape, surface texture, color, translucency, and alignment of the anterior teeth, as well as their relationships to intraoral soft tissues, lips, and the face.
[2].Lithium disilicate glass-ceramic has shown promising results and high survival rates as a veneer.
[3].IPSe.max CAD is machined and delivered in different states because of the phase transformation from partially crystallized to fully crystallized phase.The unique microstructure composition of the lithium disilicate ceramics plays a significant role in the optical properties.
[4,5].Light-cured resin-based materials with better color stability are recommended to be used for cementation ceramic laminate veneers.
[6].The Luminosity is determined by the quantity of reflected light from the ceramic laminate veneers.
[7,8].The adverse conditions in the oral environment may cause changes in the luminosity of ceramic materials and cements.
The purpose of this in-vitro study was to evaluate the luminosity of ceramic laminate veneers fabricated from IPS e.max CAD ceramic. The hypothesis was that the luminosity would affect by aging.

II. MATERIALS AND METHODS

A resin maxillary left central incisor typodont (PR02001-UL-SP-FEM-32, Nissin Dental Products Inc, Kyoto, Japan) was prepared to accommodate the 0.5 mm thickness of the veneer. The milling of the restorations was done by a 5 axis (wet/dry) milling machine (Coritec 350i Loader pro+, Imes-IcoreGmbh, Eiterfeld, Germany). Wet milling was used for IPS e.max CAD blocks(IvoclarVivadent). The IPS e.max CAD veneers were crystallized and glazed using a compatible ceramic furnace (Pogramat P500, IvoclarVivadent, Schaan, Liechtenstein) according to the manufacturer's instructions.

The fitting surfaces of IPS e.max CAD veneers were etched using 9% hydrofluoric acid (Porcelain Etch, Ultra Dent, Utah, USA) for 20 seconds. Then, the fitting surfaces were water rinsed and air-dried. A thin coat of universal primer (Monobond N, IvoclarVivadent, Schaan, Liechtenstein) was applied to the pretreated surfaces for 60 seconds. A strong stream of air dispersed any remaining excess.

The fabricated abutments were etched with 37% phosphoric acid (N-Etch,IvoclarVivadent, Schaan, Liechtenstein), washed with water,and gently were air-dried. A compatible bonding agent was selected according to the type of cement. Tetric N-Bond Universal (IvoclarVivadent, Schaan, Liechtenstein) was used. Rely X Veneer (3M ESPE, Minnesota, United States) was used for cementation the ceramic laminate veneers.

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The color measurement was performed after 24 hours and calculated through Spectrophotometric reflection apparatus (UV-Shimadzu 3101 PC, Agilent Technologies Inc, California, USA). The specimens were exposed to aging, the color measurement reperformed.

III. RESULTS

The descriptive statistics include the mean, standard deviation values of the L* coordinate after cementation and after aging. It was found that the mean L* value was decreased after aging.

MATERIAL	L* AFTER CEMNTATION	L*AFTER AGING
IPS e.max	76.6920	74.2760
	0.43140	0.38292

IV. DISCUSSION

The hypothesis of the study was that the luminosity would be affected by aging. The luminosity of the ceramic laminate veneers value decreased after aging. therefore, the hypothesis was accepted.

Light-cured resin cement was used in this study. For the translucent ceramics, the use of translucent shade resin cement was recommended as it exhibited significantly lower color changes than other shades[9]. Dual cured resin cement had less color stability than light-cured resin cement after aging. The cause of that likely returns to chemical initiator amine that is prone to degradation and the presence of unreacted camphorquinone leading to yellowish discoloration. Whereas the co-initiator amine in the light polymerization system is more chemically stable, tending to cause less color variation[4]. The double setting mechanism of dual-cured resin cements aims to achieve a higher degree of conversion[10].The IPS e.max CAD was used in this study because of its high translucency and unique structure. The IPS e.max CAD was the most translucent material compared with the materials after cementation and aging with the least decrease in ΔL*, Δa*, Δb*[11].

The L* values decreased, after aging. So, the luminosity of the ceramic laminate veneers decreased with time. The ceramic laminate veneers get darker. These findings were in agreement with previous studies. **Bagis and Turgut (2013)** reported that ceramic laminate veneers (0.5mm thickness) get darker and more red, and yellow after aging. the aging process caused the ceramics to become opaquer and more saturated[12].**Lee and Choi (2018)**concluded that the aging reduced the L* values and increased the a* and b* values of the ceramic laminate veneers (0.5mm thickness)[9].**Choi et al (2021)**found that L*, TP, and Tt had lower values after aging[13].

V. CONCLUSION

It was concluded that the luminosity of ceramic laminate veneer is decreased by aging. The limitations of this research are that only one type of resin cements and ceramic material are used. Further in vivo studies are recommended to evaluate the luminosity of different materials of ceramic laminate veneers. Moreover, the effect of additional types and shades of resin cements on the luminosity of ceramic laminate veneers should be evaluated Torque increase

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