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## EVALUATION OF TRANSLUCENCY AND ITS INFLUENCE ON THE OPTICAL BEHAVIOR OF CURRENT CERAMIC CROWN SYSTEMS

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## INTRODUCTION

The main reason for fabricating a ceramic restoration is the depth of translucency that it possesses, allowing for increased light transmission and diffusion similar to that provided by the natural teeth. The absence of a metal substructure minimises the undesirable light reflection produced by the layer of highly reflective opaque porcelain masking its dark appearance. Nevertheless, the various current ceramic or glass-ceramic systems provide restorations with a depth of translucency that differs from that of natural teeth in various degrees.

The aim of the study was to evaluate the light transmittance of different ceramic crown systems and its influence on the optical behavior of the teeth bearing the finished restorations. Also to compare this optical behavior to that of natural teeth. For this purpose, the study was performed in two phases.

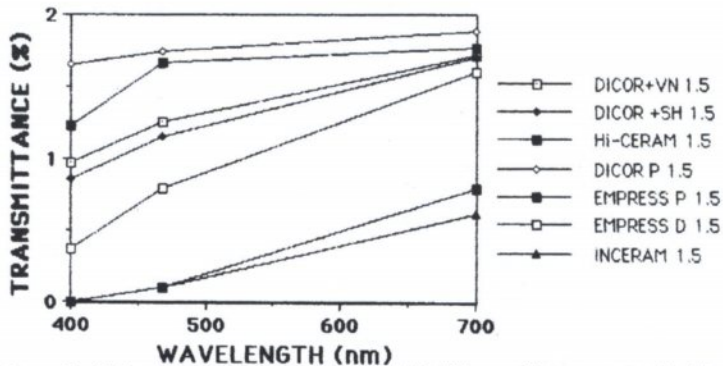
## PHASE I METHODS AND MATERIALS

Groups of 5 ceramic discs of 10mm diameter, 1mm and 1,5mm in thickness, were prepared using the following systems: Dicor (plain), Dicor+shading, Dicor (0,5)+Vitadur-N, Hi-Ceram (0,5)+Vitadur-N, In-Ceram(0,5)+Vitadur-N, Empress (neutral-opacity I), Empress (dentine).

Evaluation of light transmittance of the specimens was performed in the range of 400-700nm utilising a 2,5mm beam path at 200nm/min. on a double beam UV-Vis spectrophotometer.

## 1.5 mm SAMPLE THICKNESS

## RESULTS



Specimens of 1mm in thickness, always presented increased light transmittance compared with the specimens of 1,5mm in thickness. The difference of transmittance tended to decrease from 400 to 700nm of the spectrum. The lowest degree of transmittance was presented by Hi-Ceram and In-Ceram samples. The highest transmittance was presented by plain Dicor and neutral Empress samples. However, the application of several layers of shading porcelain on the surface of Dicor drastically reduced light transmittance. The combination of Dicor and Vitadur-N presented moderate degree of light transmittance similar to that of Empress dentine. All systems and especially Hi-Ceram and In-Ceram presented reduced light transmittance (increased absorbance) in the area of 468 Nm of the spectrum where the critical peak absorbance for light curing cements is found.

## PHASE II METHODS AND MATERIALS

Five recently extracted and preserved upper central incisors were prepared to a full shoulder finish line (1.00mm). For all teeth crowns were fabricated in a general shade of A1 of Vita lumin Vacum shade guide using the following systems:

Dicor + shading, Dicor + Vitadur N, Hi-Ceram + Vitadur N, Empress (neutral, opacity II) and Empress (Dentine-layering technique). All crowns were slightly stained and glazed.

The teeth were transilluminated and standardized Ektachrome slides were taken before they were prepared and after, bearing the various restorations that were interchanged. The slides were examined by the authors in regard to the depth of translucency that was presented by the various crowns. The optical transition from the natural tooth substance to the restorative material was evaluated and compared to the optical behavior of the unprepared natural tooth. Thus the potential effect of the underlying natural tooth structures was eliminated.

## RESULTS

Most restorations of all systems, presented incisal translucency similar to that of the unprepared teeth. In the cervical two thirds of the crowns however, the depth of translucency provided by the restorations was different from that of the natural teeth in various degrees.

Teeth bearing crowns made with Dicor + shading and Neutral Empress presented increased translucency where as the ones with Hi-Ceram + Vitadur N and In-Ceram + Vitadur N presented reduced translucency compared to that of the natural teeth.

Teeth bearing crowns made with Dicor + Vitadur N and dentine Empress (layering technique) presented translucency and light scattering comparable to that of the natural teeth.

## DISCUSSION & CONCLUSIONS

Phase I of the study showed that the materials produced by the ceramic crown systems which were tested presented various degrees of light transmittance. Castable ceramics such as Plain Dicor and Neutral Empress being uniform, allowed increased light transmission. Dentine Empress showed moderate transmittance due to the increased absorbance produced by color that is contained in the material. The application of a layer of shading porcelain over the surface of Dicor drastically cut-off light transmission.

Systems involving the use of a rather opacious core such as Hi-Ceram and In-Ceram combined with a porcelain build-up, presented reduced light transmittance. The use of a translucent Dicor core in combination with porcelain presented transmittance comparable to Dentine Empress. Projecting these findings to the results of Phase II of the study, the conclusion is reached that moderate translucency presented by a non uniform but translucent material such as the combination of Dicor with porcelain or Empress dentine, applied with layering technique produces restorations that come closest to the optical behavior of natural teeth.

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