Effect of Light-Curing Distance on the Degree of Conversion of a Resin-Modified Glass Ionomer Cement.

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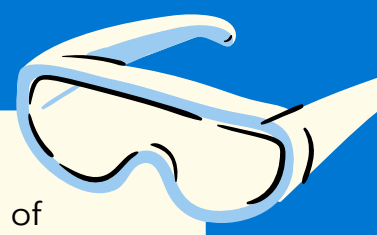
Background

Glass ionomer cements (GICs) are bioactive restorative materials that have a wide range of applications, including lining, bonding, sealing, cementing, and restoring a tooth. Although adhesion to tooth structure, fluoride release capacity, and tooth-colored restorations are the main properties of GICs for broader applications in dentistry, sensitivity to moisture, inherent opacity, long-term wear, and strength are not as desirable. Light-curing, polymer-reinforced materials appear to have significant advantages while retaining fluoride release and adhesion benefits. A lot of laboratory research has been done on the depth of cure of a visible light activated resin. The characteristics of the polymerized resin composite that is farthest away from the light source have been measured using a variety of methods.



OBJECTIVE

To determine the effect of cavity depth and light intensity on the degree of conversion of resin-modified glass ionomer cement

MATERIALS

1.White acrylic board size 15.0×15.0×1.8 mm.
2.Resin-modified glass ionomer cement
(A3 shade of GC Gold Label II LC capsule from GC, Tokyo, Japan.)
3.Demiplus light-curing unit (Kerr, CA, USA)
4.micro-Raman spectrometer (LabRam HR Evolution, Horiba, Kyoto, Japan)
5.LED radiometer (Demitron, Kerr, WI, USA)

RESULT

The study found that both light irradiance and degree of conversion percentages varied across different distances.

The mean light irradiance values were :
525 mW/cm2 (SD = 16.67) at 0 mm.
250 mW/cm2 (SD = 26.35) at 4 mm.
186 mW/cm2 (SD = 9.66) at 8 mm.

The degree of conversion percentages were :
41.41% (SD = 13.93) at 0 mm.
44.64% (SD = 8.33) at 4 mm.
47.97% (SD = 5.70) at 8 mm.

However, there are no statistical different in the degree of conversion.

METHOD

Specimens were prepared using a white acrylic board, sectioned into plates measuring 15.0×15.0×1.8 mm. Each plate featured a central 3 mm diameter cylindrical slot, supported by celluloid bands.

The RMGIC was mixed and injected into these slots, followed by smoothing and leveling the material. A Demiplus light-curing unit was employed for curing, with distances of 0 mm, 4 mm, and 8 mm between the light tip and the specimen, controlled using a specially designed acrylic plate.

The degree of monomer conversion (DC, %) was gauged using a LabRam HR Evolution micro-Raman spectrometer. Light irradiance was quantified using a Demitron LED radiometer, with irradiance values measured at specified distances of 0 mm, 4 mm, and 8 mm.

CONCLUSION:

The study supports the application of RMGIC for restorative purposes across different cavity depths, showing no significant impact on DC. The inclusion of hydroxyapatite nanoparticles and the absence of traditional aromatic monomers in the RMGIC formulation are key considerations for future research, particularly for understanding the long-term behavior and efficacy of such materials in dental applications.

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