The Effect of Increment Thickness and Light Curing Distance on Flexural Strength, Microhardness and Cytotoxic Behavior of Two Resin Modified Glass Ionomer Cements

Thesis
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I dedicate my work to my family to whom I owe everything for, my husband for his continuous support, my two lovely kids who always inspire me to improve myself. Your love and trust are my foundations.

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Demands for esthetic restorations have increased significantly in the last few decades. Tooth colored restorative materials have developed to satisfy patients' needs. The most popular esthetic restorations are resin composites and glass ionomer cements (GICs). Hydrophilic polymerisable monomers were added to GIC to produce resin modified glass ionomer cements (RMGIC)[1]. While maintaining adhesion to tooth structure and fluoride release of GICs[2], RMGIC have the benefits of longer working time, early strength development, decreased early moisture sensitivity[3], improved esthetics and the ability to copolymerize with other resin based restorative materials[4].

Restoring deep Class II cavities while achieving perfect marginal seal is still controversial. The sandwich technique was first described by Mclean and Wilson [5] to replace the highly moisture sensitive resin composite with GIC in deep subgingival cavities. Later on the use of RMGICs surpassed that of GIC due to their decreased early moisture senstivity[6]. Unfortunately, placing the light curing guide in direct contact with the RMGIC in deep proximal cavities cannot be done. The increased distance between the restoration and curing guide tip might affect the total irradiation energy reaching the restoration, altering the degree of monomer conversion in the final set material and thereby the mechanical properties of the material including microhardness and flexure strength.

Some clinicians assume that RMGIC could be placed in bulk like GICs, light attenuation throughout the material thickness, is expected which might affect the degree of monomer conversion at the deeper parts of the restoration. Relative microhardness test performed by comparing bottom/top microhardness of the material has been frequently used to investigate the material depth of cure[7,8].

Flexure strength was used to test materials tensile strength as the material fails in flexure testing when the maximum tensile stress is reached[9]. Tensile strength is a crucial property in restorative materials since most restorative materials fail in tension when subjected to occlusal loading.

Soft tissues local responses frequently reported after insertion of restorative materials could be due to incomplete polymerization of the material, leading to immediate leaching of components from the restoration[10]. Cytotoxic in-vitro tests are advantageous to test tissue response to materials since they have the benefits of being safe, easily controllable and reproducible when compared to the in-vivo studies[11].

Therefore, studying the effect of different distances from light curing guide and different increment thicknesses on the material flexure strength, microhardness and cytotoxicity could give insight on the effect of these variables on a restoration's mechanical performance as well as its biocompatibility.