Comparative analysis of flexural strength and bonding interface of two recent modifications of Glass Ionomer Cements - An in-vitro study

By

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ABSTRACT

Title: Comparative analysis of flexural strength and bonding interface of two recent modifications of Glass Ionomer Cements - An in-vitro study

Background & Objectives: Glass Ionomer Cements are a group of restorative materials with many advantages like ease of manipulation, fluoride release and chemical bonding to the tooth. But, the lack of good mechanical properties is one of the major drawbacks of GIC which makes it inferior to other restorative materials. However, it still is one of the most widely used restorative material in the treatment of non-carious cervical lesions (NCCLs). To improve the mechanical properties, many newer modifications have been tried in the Glass Ionomer Cements.

As recent studies indicate the evidence of eccentric flexural loading on the teeth as the main etiologic factor for NCCLs, it becomes imperative for the restorative materials used for the treatment of these lesions to have good flexural strength and bonding to the tooth. In an attempt to achieve this, and improve the mechanical properties of GICs various modifications have been tried.So, in the study conducted, the flexural strength and the tooth restoration interface of two such newer Glass Ionomer Cements were analysed

Materials and Methodology:

Flexural Strength testing: Silicon molds of size 2x2x25mm were prepared. They were randomly divided into three groups of 17 samples each. (Group A: Fuji IX GIC, Group B: Micron Bioactive, Group C: Equia Forte HT). The test materials were mixed and dispensed according to the manufacturer's instructions and filled into the silicon molds. After removal of the set materials from the molds, they were subjected to flexural strength testing in an Universal Testing Machine by performing a Three point bending test.

To check Bonding interface by SEM: Cavities with dimensions 2x2x2 mm was prepared on the buccal surface of the extracted teeth in the cervical region on fifteen teeth. The teeth were then randomly segregated into three distinct groups consisting of 5 samples each and restored with the respective materials following which they were sectioned buccolingually subjected to scanning electron microscopy.

Result: Based on the analysis of values obtained from flexural strength evaluation, by means of the post hoc bonferroni test, the comparison between Groups produced a p-value of less than 0.05, demonstrating a big change between these two groups. The finding indicates Group C has statistically significant higher Flexural strength when compared to that of Groups A and B ($p < 0.05$). The SEM evaluation of the bonding interfaces also demonstrated that Group C had a more well defined and cohesive bonding interface in comparison to Group A and Group B.

Conclusion: The study found that Equia Forte-HT exhibits superior flexural strength compared to Micron Bioactive and Fuji IX GIC. The greater flexural strength of Equia Forte-HT indicates its suitability for restorations in load-bearing areas, where resistance to stress and deformation is critical. Equia Forte-HT also demonstrated a more cohesive and stronger bonding interface, which can be attributed to its improved resin-modified formulation.

Keywords: Flexural Strength, bonding interface, Scanning Electron Microscopy, Micron Bioactive, Equia Forte HT, GIC

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