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Microhardness of Giomer and Compomer Restorative Material- An Invitro Study

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ABSTRACT

Background: The present study was conducted to compare the microhardness of Giomer and Compomer restorative material. **Methods**: This study was conducted on Giomer (Beautiful II) which was in group I and the compomer (Dyract®) in group II. Microhardness was tested with the Vicker's microhardness test using universal testing machine. **Results**: The mean microhardness of giomer was 54.2 MPI and of compomer was 40.5 MPI. The difference was significant (P< 0.05). **Conclusion**: Authors found that giomer had highest microhardness as compared to compomer.

Keywords: Compomer, giomer, Microhardness.

INTRODUCTION

The property of hardness is of major importance in the comparison of restorative materials. Composite resins allow for a conservative preparation of the tooth structure and esthetic results, enabling to build a restoration without the intervention of the dental laboratory. Other advantages include: wear-resistance close to the natural tooth structure, good marginal integrity, they can be repaired intraorally and/or replaced by ceramic or composite indirect restorations and they have low costs.[1]

Giomer is a relatively new innovative filler technology of resin composite as an esthetic direct restorative material for anterior and posterior teeth restoration. Similar to a traditional methacrylate-based composite, the chemical composition encompasses inorganic filler particles and organic-resin matrix.[2]

Compomers are best described as composites to which some glass ionomer components have been added.[3] Overall, their physical properties are superior to traditional glass ionomers and resin modified glass ionomers but inferior to those of composites. They are mainly used for class V restorations. Although Compomers are capable of releasing fluoride, the release is not sustained at a constant rate.[4] Composite resins are the most commonly used direct restorative materials that meet the requirements of preservation of tooth structure, high esthetic appearance, and longevity. Microhybrid composites give high polishability and good mechanical properties and they are considered as all-purpose universal composite resins.[5] The present study was conducted to compare the microhardness of Giomer and Compomer restorative material.

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MATERIALS AND METHODS

This study was conducted in the department of Pedodontics. It consisted of two restorative materials. The Giomer (Beautiful II) was in group I and the compomer (Dyract®) in group II. The study was approved from the institutional ethical committee.

The microhardness of giomer and compomer was tested according to ASTM guidelines. The samples (20) for microhardness testing were made using a stainless steel mould with cylindrical holes having 3 mm height and 6 mm diameter. The giomer and compomer were all single component pastes and were packed tightly into the cylindrical holes in the mould. The samples were then stored in distilled water in an incubator (NSW, Mumbai) maintained at 37oC for 23 hours. Microhardness was tested with the Vicker's microhardness test using universal testing machine. Results were subjected to statistics. P value less than 0.05 was considered significant.

RESULTS

Table 1: Distribution of materials

Groups	Group I	Group II
Materials	Giomer	Compomer
Number	10	10

[Table 1] shows that group I had giomer and group II had compomer as restorative material.

Table 2: Microhardness in both groups

Groups	Mean	P value
Group I	54.2	0.01
Group II	40.5	

[Table 2, Figure 1] shows that mean microhardness of giomer was 54.2 MPI and of compomer was 40.5 MPI. The difference was significant (P< 0.05).

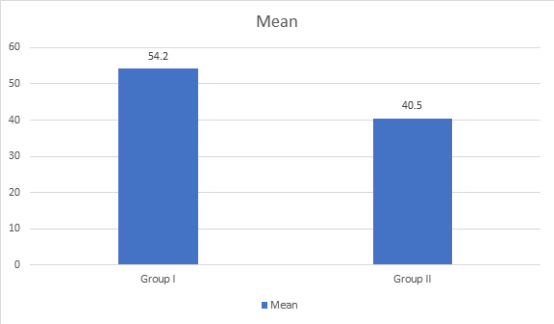

Figure 1: Microhardness in both groups

DISCUSSION

Glass ionomers have several advantages like ability to bond to dental hard tissues, fluoride release and co-efficient of thermal expansion similar to tooth structure.[6] Resin Modified Glass Ionomer Cements (RMGIC) were introduced in 1990s to overcome the drawbacks of conventional GIC, by possessing a prolonged working time, improved translucency, faster set and attainment of early strength.[7] In place of applying purely glass or quartz as the typical fillers, the Giomer incorporates inorganic fillers that are derived from the complete or partial reaction of ion-leachable fluoroboroalumino silicate glasses with polyalkenoic acids in water before being interfaced with the organic matrix.[8] This created a stable glass-ionomer phase on a glass core in which they induced an acid-base reaction between acid reactive fluoride containing glass and polycarboxylic acid in the presence of water and developed as a pre-reacted glass ionomer (PRG) filler. The pre-reaction can involve only the surface of the glass particles called surface reaction type PRG (S-PRG) or almost the entire particle termed full reaction type PRG (F-PRG). Beautifiluses S-PRG (surface reaction type) where only the surface of the glass filler is attacked by polyacrylic acid and a glass core remains.[9] The present study was conducted to compare the microhardness of Giomer and Compomer restorative material.

In present study, group I had giomer and group II had compomer as restorative material. We found that mean microhardness of giomer was 54.2 MPI and of compomer was 40.5 MPI. The difference was significant (P< 0.05). Vijayan et al,[10] evaluated microhardness of a relatively new material Giomer as compared to other commonly used resin based restoratives; Compomer, Hybrid Composite and Resin modified glass ionomer (RMGIC). Ten sample discs were made from each of the four restorative materials using stainless steel moulds. The surface microhardness of the Giomer, Compomer, Hybrid Composite and RMGIC were measured on each side using a Vicker's microhardness tester at a magnification 500X. A 100gload with a holding time of 15 seconds was used for all the samples. The size of the indentations was used to measure the microhardness of the test materials. The microhardness of all the four materials differed significantly from each other (p<0.001). The highest value was given by Giomer which was significantly harder than Hybrid Composite which in turn was significantly harder when compared to RMGIC. The Compomer showed the lowest value among the four test materials. The order of hardness from highest to lowest is as follows: Giomer> Composite> RMGIC> Compomer.

Ulvestad,[11] suggested that one of the methods of evaluating a material's resistance to attrition is to apply a hardness test. The value of hardness often referred to as hardness number depends on the method used for its evaluation. Common methods used for hardness evaluation include Vickers, Knoop and Brinell. The Vickers test is suitable for determining the hardness of quite brittle materials.

The marginal fit of direct composites might be improved by heating them before application. With modern composites and adequate technique, adhesion to enamel is excellent and to dentine it is increasingly good. The optical properties allow for a close reproduction of color and translucency of natural teeth. Another group of direct restorative materials that are known to offer high protection against the development of new carious lesions, by releasing fluoride, are the glass ionomers.[12] The glass-ionomers adhere chemically to the tooth structure and arrest the marginal micro-leakage of the fluids and microorganisms towards the restored surface. However, the mechanical resistance of the glass-ionomers is very weak.

CONCLUSION

Authors found that giomer had highest microhardness as compared to compomer.

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