Research Article

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Comparative Evaluation of Tensile Bond Strength and Shear Bond Strength of Amalgomer CR And Fuji IX: An In vitro Study

Himanshu Joshi[1*] Rani Somani[2] Shipra Jaidka[3] Deepti Jawa Singh[4] Arpit Sikri[5] Varun Verma[6]

[1]PG Student, Department of Pedodontics and Preventive Dentistry, DJ College of Dental Sciences and Research, Modinagar, Ghaziabad, India.
[2]Professor and Head, Department of Pedodontics and Preventive Dentistry, DJ College of Dental Sciences and Research, Modinagar, Ghaziabad, India.
[3]Professor, Department of Pedodontics and Preventive Dentistry, DJ College of Dental Sciences and Research, Modinagar, Ghaziabad, India.
[4]Professor, Department of Pedodontics and Preventive Dentistry, DJ College of Dental Sciences and Research, Modinagar, Ghaziabad, India.
[5]Senior Lecturer, Department of Prosthodontics, Santosh Dental College & Hospital, Santosh Deemed to be University, Ghaziabad, Delhi, India.
[6]Private Consultant, Dr Verma's Dental Clinic and Implant Centre, Delhi, India.

ABSTRACT

Aim: To evaluate and compare the tensile bond strength and shear bond strength of Amalgomer CR and Fuji IX.

Materials and Methods: For tensile bond strength evaluation, 40 standardized autoclavable molds were taken and divided into two groups each which were then restored with Fuji IX and Amalgomer CR respectively. After incubation pellets were stored into distilled water and were subjected to tensile bond strength in universal testing machine, for shear bond strength evaluation, 40 non-carious extracted premolars, divided into two groups were restored with Amalgomer CR and Fuji IX respectively. Post incubation for 24 hours they were subjected to sheer bond strength in a universal testing machine.

Result: Tensile bond strength of Fuji IX was 11.05 and of Amalgomer CR was 29.38 while the shear bond strength of Amalgomer CR was 6.20 and of Fuji ix was 5.06. Amalgomer CR showed higher tensile bond strength and shear bond strength than Fuji ix.

Conclusion: Amalgomer CR can be recommended as permanent restorative material on account of good tensile strength and shear bond strength.

Keywords: Tensile bond strength, Shear bond strength, glass ionomer cement.

INTRODUCTION

Dental caries is the commonest dental disease affecting human population[1]. The ideal choice of treatment for a carious lesion is excavation, followed by restoration. The success of any restoration depends upon the type of restorative material used and the characteristics of the cavity in which it is to be placed. Some of the ideal requirements for a restorative material are that it should have good esthetics, stability, biocompatibility, excellent marginal seal and good flexure strength, to bear masticatory forces and avoid fracture of the same.

A restored tooth tends to transfer stress differently than an intact tooth. Any force on the restoration produces compression, tension or shear along with the tooth/ restoration interface, leading to complex stress distributions. Therefore, it is a basic need for a restorative material to have good physical properties[2]. Glass ionomer cement is one of the commonly used restorative materials introduced into the dental arena by Wilson and Kent way back in 1972. It has the advantage of fluoride release and ability to adhere to the tooth structure, but due to low wear resistance, it is suspectable to fracture

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***Correspondence Dr. Himanshu Joshi.**
Department of Pedodontics and Preventive Dentistry, DJ College of Dental Sciences and Research, Modinagar, Ghaziabad, India.
Email: himanshujoshi750@yahoo.com

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and made it unsuitable for areas where masticatory load is maximum[3].

Hence, a new material Amalgomer CR has been introduced by Advance healthcare ltd. Instead of glass or quartz, ceramic was used as fillers for better resistance[4]. For any new material to be acceptable, it needs to have comparable or better properties than its conventional variant. Thus, in light of the above knowledge, the study is designed to compare and evaluate the tensile bond strength and shear bond strength of Amalgomer CR and Fuji 1X.

MATERIALS AND METHODS

EVALUATION OF TENSILE BOND STRENGTH

Forty standardized molds mere made of 4mm diameter and 3mm height (Figure 1). Then they were divided into two groups with colour-coding namely Group I for Amalgomer CR (pink) and Group II for Fuji IX (green). All the moulds were restored with respective restorative material according to manufacturer's instructions (Figure 2). After setting of restorative material, the pellets were taken out from the molds, incubated for 24 hrs to stimulate oral conditions and then stored in labelled sterile containers to allow the restoration to set completely. Thereafter they were subjected to tensile strength determination using Instron Universal testing machine. (Figure3).

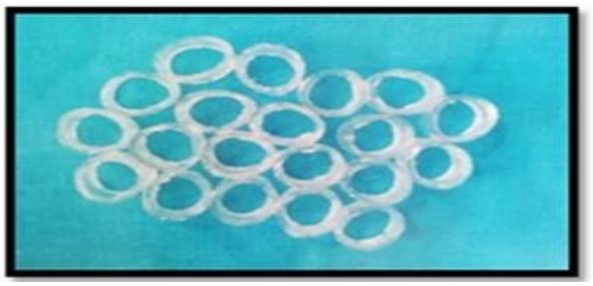


Fig 1: Standardized molds.

Fig 2: Restorative pellets.

Fig 3: Values obtained for tensile bond strength.

EVALUATION OF SHEAR BOND STRENGTH

A sample size of 40 teeth was taken after confirming the statistical validity of the study. For shear bond strength evaluation, 40 non-carious human premolar teeth extracted for the orthodontic purpose was taken. The teeth were scaled and autoclaved. Each tooth was held in hand and dentin was exposed from the buccal surface using a diamond disc bur in the micro motor. Dentin conditioner was applied on the prepared buccal surface of the crown and was allowed to dry for 30 seconds in all teeth. The samples were divided into two groups with colour coding, namely, Group A as Amalgomer CR (pink) and Group B as Fuji IX (green) respectively. All the samples were restored with respective restorative material till a height of 2mm acc. to manufacturer's instructions. (figure 4). The height of 2mm was measured using vernier calliper. Samples were then incubated for 2 hrs before testing for shear bond strength using a universal testing machine.

All the values obtained were then tabulated and statistically analyzed. (figure 5)

Fig 4: Prepared samples after restoration.

Fig 5: Value obtained in the universal testing machine for shear bond strength.

RESULTS

Tensile Bond Strength: The mean value of tensile bond strength was higher in Group I (Amalgomer CR) was 29.38 than in Group II (Fuji IX) was 11.05 (Table 1,2), (Graph 1) Shear Bond Strength: The mean value of shear bond strength was higher in Group A (Amalgomer CR) was 6.20 than in Group B(Fuji IX) was 5.06 (table 3,4),(Graph 2)

Table 1: Mean value of tensile bond strength of the various groups.

Group**	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Group I	20	29.385	1.5872	0.3549
Group II	20	11.050	1.3885	0.3105

**Group I- Amalgomer CR **Group II- Fuji IX

Table 2: Intergroup Comparison of the Tensile Bond Strength of Various Groups.

	T Value	(P value)*	Mean Difference
**Group I VS Group II	38.883	0.00	18.3350

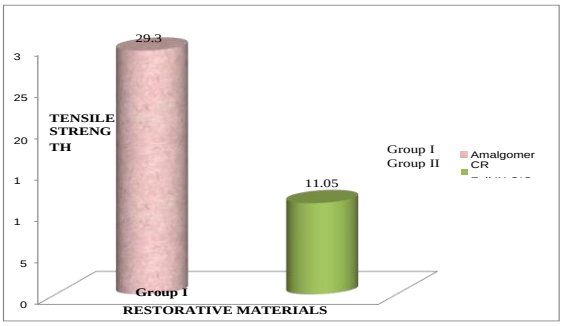
Table 3: Mean Value of Shear Bond Strength of Various Groups.

Groups**	N	Mean	Std. Deviation	Std. Error Mean
Group A	20	6.125	0.6528	0.1460
Group B	20	5.660	0.6142	0.1373

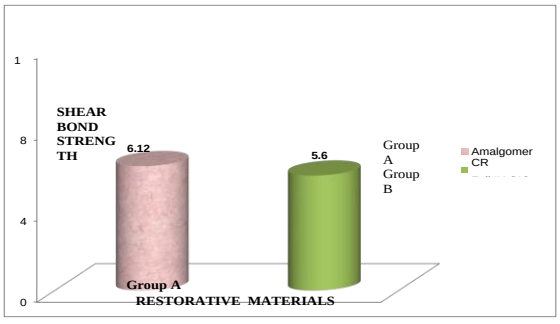
Table 4: Intergroup Comparison of Shear Bond Strength of Various Groups.

	T Value	(P value)*	Mean Difference
**Group A VS Group B	2.320	0.056	0.4650

**Group A- Amalgomer CR **Group B- Fuji IX *P value ≤ 0.05 Significant P value ≥ 0.05 Non Significant



Graph 1: Graphical analysis of the Tensile Strength of the studied groups.



Graph 2: Graphical analysis of shear bond strength of the studied groups.

DISCUSSION

The physical properties like tensile bond strength and shear bond strength are two of the main requisites for the success of any restorative material. When Amalgomer CR and Fuji 1X had been compared, it was seen that Amalgomer CR had better tensile bond strength and shear bond strength than Fuji 1X.

The reason might be because the filler content which is mainly quartz in GlassIonomer Cement is reinforced by ceramic particles in Amalgomer CR. According to the manufacturer, the ceramic filler is able to react partially with the matrix, which may produce some bonding and thus increases the overall strength of the restoration. While in Glass ionomer Cement Fuji IX no such reinforcement of filler particles is reported. The same results have been appreciated by **Ayad et al. (2008)**[5].

Likewise, shear bond strength was also found to be statistically higher in Group A (Amalgomer CR) than Group B (Fuji IX). This may be due to micronization i.e. reduction in the particle size of Amalgomer CR so that they are packed more compactly and thus increases the shear bond strength. Moreover, it has been reported that Amalgomer CR has much higher flexural strength and fracture toughness as compared to conventional GIC. This result was in accordance to a study done by **Murthy SS and Murthy SG (2015)**[6] in which Shear bond strength of Amalgomer CR was compared with Miracle Mix and Ketac Molar and found that the shear bond strength of Amalgomer CR was higher than both. In another study done by **Nujella et al. (2013)**[7] shear bond strength of Fuji IX was found to be less than that of Fuji II LC and Compoglas F. Well within the limitations of the study, it can be concluded that Tensile strength and Shear bond strength of Amalgomer CR was statistically more than that of Fuji IX

CONCLUSION

Within the limitations of the study, it is evident that Tensile strength and Shear bond strength of Amalgomer CR was more than that of Fuji IX. Hence Amalgomer CR can become a versatile good restorative material for areas where the masticatory load is high.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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