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Original Research

A study on resin composite and glass ionomer materials in class II restorations in permanent teeth

Nida Mehmood

BDS, MDS, Private Practitioner, India

ABSTRACT:

Background: To study resin composite and glass ionomer material in class II restorations in permanent teeth. **Materials & methods:** A total of 50 cavities on approximal surfaces were filled with the composite material or GIC. They were classified as A- TetricEvoCeram and B- Equia Fil with 25 teeth in each group. The number of patients enrolled were 30. The age included was 15 to 35 years. The materials were applied according to manufacturers' instructions. The results were analyzed using SPSS software. **Results:** A total of 50 teeth were evaluated. On radiographic evaluation, the 56% of restoration were done at D2 level with TetricEvoCeram whereas 48% were done with Equia Fil. At D3 level, 36% with tetricevoceram and 32% with equia fil. **Conclusion:** Both have similar efficacy as used in class II restorations.

Keywords: permanent teeth, glass ionomer cement, composite resins.

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Corresponding author: Nida Mehmood, BDS, MDS, Private Practitioner, India

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INTRODUCTION

During the last decades, an increasing variety of dental restorative materials have conquered the market. Gold and ceramics are the main standard material used for indirect restorations, and until the late seventies amalgam was used for direct restorations. [1] The use of amalgam has been critically discussed due to its allergic and toxic potential upon mercury release. [2] Today, the decreased number of amalgam fillings is also influenced by a high demand for tooth-colored and biocompatible restorations. [1] Great studies in dental research have led to a variety of alternatives to amalgam. [3] An increased demand for direct filling materials was supported by changes in restorative techniques. The development of adhesive techniques saves sound tooth structure and is compatible with prophylactic concepts. Preserving and stabilizing tooth hard tissues by direct filling techniques is more and more in favor, in contrast to destructive preparations with indirect restorative materials. [4]

Composite materials are the most frequently used ones for direct restoration of missing dental structures on approximal surfaces of premolars and permanent molars. [5] They are characterized by durability, hardness and wear-resistance comparable with enamel; they also have excellent polishability. [6] However, they do not have the potential for remineralization of the partially demineralized dentine at the bottom of the cavity. They are also burdened with cytotoxicity, which can decrease treatment efficacy of caries profunda. Several researchers associate the occurrence of pulpal inflammatory reactions, as well as cellular apoptosis, with monomers that they release. [7] It is particularly valid in newly erupted permanent teeth with higher permeability of dentine (thin layer of primary dentine, wide dentinal tubules). Glass ionomer cements have high biocompatibility and remineralization potential. They are readily used in pediatric dentistry for permanent restorations of lesions in deciduous teeth and for correction of minor defects in permanent teeth; they are also suitable as temporary restorations of deep carious lesions, or when reduction of the risk of caries is necessary. [6,8,9] Glass-ionomer cements may be used in a wide range of clinical applications due to the ability to modify their physical properties by changing the powder/liquid ratio or chemical formulation.[10] The glass-ionomer cements are esthetically more attractive than metallic restorations. [11] In addition, by incorporating fluorine, they exhibit an anticariogenic potential, and they have good biocompatibility and chemical adhesion to mineralized tissue. [12] On the other hand, poor

mechanical properties, such as low fracture strength, toughness and wear, limit their extensive use in dentistry as a filling material in stress-bearing areas. [13,14] In the posterior dental region, glass-ionomer cements are mostly used as a temporary filling material. [15] Hence, this study was conducted to study resin composite and glass ionomer material in class II restorations in permanent teeth.

MATERIALS & METHODS

A total of 50 cavities on approximal surfaces were filled with the composite material or GIC. They were classified as A- tetricevoceram and B- equia fil with 25 teeeth in each. The number of patients enrolled were 30. The age included was 15 to 35 years. During control examinations, the condition of each restoration was assessed. Bitewing radiographs had been taken before fillings were placed and after 12 months. Class II lesions in premolars and molars were prepared according to generally accepted methods of cavity restoration with composite materials and GIC. The materials were applied according to manufacturers' instructions. The results were analyzed using SPSS software.

RESULTS

A total of 50 teeth were evaluated. On radiographic evaluation, the 56% of restoration were done at D2 level with tetricevoceram whereas 48% were done with equia fil. At D3 level, 36% with tetricevoceram and 32% with equia fil.

Table 1: Depth of lesions filled with TetricEvoCeram and Equia Fil – radiographic evaluation.

Materials used	D1 – radiolucency in 1/3 of outer dentine	D2 – radiolucency in 1/3 of inner dentine	D3 – radiolucency reaching 1/3 of inner dentine	Total
TetricEvo Ceram	2 (8)	14 (56)	9 (36)	25(100)
Equia Fil	5 (20)	12 (48)	8 (32)	25(100)

Table 2: Comparison of mean values of the examined materials after 12 months

Evaluation criteria	A (mean)	B (mean)	p- value
Condition of the restoration	1.125	1.902	0.001*
Discoloration	1.103	1.342	0.002*
Marginal adaptation	1.201	1.468	0.001*

*: significant

Mean values were examined for both the materials. On evaluation of marginal adaptation, the mean for tetricevoceram was 1.201 and for equia fil was 1.468. The results were significant with p- value as less than 0.05. The clinical efficacy of the Equia Fil material used for the restoration of approximal lesions in molars and premolars after 12 months was assessed as 96.02%; for the TetricEvoCeram material at almost 100%.

DISCUSSION

The chemical adhesion of GIC to enamel and dentin is achieved by reaction of phosphate ions in the dental tissue with carboxylate groups from the polyacrylic acid. Electro-neutrality is maintained by the displacement of calcium ions with the phosphate ions. [16] The glass-ionomer cements bond to dentin with values of tensile bond strength reported between 1 and 3 MPa. [17] These low values were observed due to the sensitivity of GIC to moisture during setting. The bond strength has been improved to 11 MPa by treatment of the dentin with a polycarboxylic acid cleaning agent. [18] Chemical adhesion of GIC to the hard tissue of teeth through the combination of polycarboxylic acids with hydroxyapatite has been cited as the most important advantage of the GIC. The ionic bonding mechanism between the acid and the hydroxyapatite is supported by observations that bond strength to enamel is greater than those to dentin, in correspondence with the relative amounts of hydroxyapatite in the two dental hard tissues. [19] Hence, this study was conducted to study resin composite and glass ionomer material in class II restorations in permanent teeth.

In the present study, a total of 50 teeth were evaluated. On radiographic evaluation, the 56% of restoration were done at D2 level with tetricevoceram whereas 48% were done with equia fil. At D3 level, 36% with tetricevoceram and 32% with equia fil. A study by Rożniatowski P et al, studied total of 100 cavities on approximal surfaces were filled with the composite material or GIC in 49 patients aged from 12.08 to 19.58 years. After two years of observations, two GIC restorations were replaced due to loss of retention and staining. The other 96 restorations were given a satisfactory grade. The clinical efficacy of Equia Fil after 24 months was assessed at 95.83%, the TetricEvoCeram at 100%. The difference was not statistically significant (P=0.145). When GIC was used, there was a higher risk of marginal adaptation deterioration and the occurrence of staining and erosion. Radiographic efficacy of the Equia Fil material for cavity restoration after 24 months was assessed at 93.75%, for the TetricEvoCeram material at 100%. Differences were not significant statistically (P=0.073).[20]

In the present study, mean values were examined for both the materials. On evaluation of marginal adaptation, the mean for tetricevoceram was 1.201 and for equia fil was 1.468. The results were significant with p- value as less than 0.05. The clinical efficacy of the Equia Fil material used for the restoration of approximal lesions in molars and premolars after 12 months was assessed as 96.02%;

for the TetricEvoCeram material at almost 100%. Another study by Mjor IA et al, studied and compared the clinical performance of an amalgam, a glass polyalkenoate (ionomer) cerment material and a resin-based composite material used in small Class II cavities in permanent teeth. The study comprised 274 Class II restorations (88 amalgams, 95 cerments and 91 resin composites) placed in 142 adolescent patients. One hundred and sixty-seven restorations were in molar and 107 in premolar teeth. Patient dropout after 5 years resulted in the loss of 161 restorations, evenly distributed for restorative material and type of tooth involved. Four amalgam restorations, 22 glass ionomer cement and nine resin composite restorations failed. The glass ionomer cerment and amalgam restorations failed primarily due to bulk fractures, while the resin composite restorations failed due to secondary caries and bulk fractures. [21]Scholtanus et al. reported similar efficacy of the Fuji IX GP Extra material (renamed as Equia Fil in some countries) for Class II restorations. [22]

CONCLUSION

Both have similar efficacy as used in class II restorations.

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