

Longevity of Posterior Restorations in Terms of Marginal Integrity: A Clinical Study Evaluating the Marginal Integrity Between the Resin Composite and Silver Amalgam in Posterior Teeth

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ABSTRACT

Objective: To evaluate the marginal integrity of silver amalgam and resin composite restorations in posterior teeth having Black's class 1 carious lesion.

Study Design: Perspective study

Place and Duration of Study: This study was conducted at the Department of Operative Dentistry, Dental Section, Punjab Medical College Faisalabad and Fatima Memorial Hospital College of Dentistry, Lahore from October 2016 to March 2017.

Patients and Methods: One hundred and sixty patients were selected having class 1 cavity in any of the mandibular molars. Radiographs were taken to assess the depth of cavity and periodontal status. 78 patients got resin composite restorations while 86 patients received silver amalgam fillings. All the restorations were performed following standard isolation protocols. The success of the restorations was assessed after six months by considering the marginal integrity. This was checked by Cvar and Ryge criteria.

Results: The Chi square statistic value that we observed with our statistical data with degree of freedom (df) 1 is 10.3385. The p-value captured by the analysis is 0.001. The result is significant at $p < 0.05$.

Conclusion: In perspective of successful restorations, good marginal integrity among all the restorations had predilection for the resin composite.

Key Words: Resin composite, Amalgam, Marginal integrity, Hybrid composite, Micro gaps, Hydrophobic

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INTRODUCTION

Dental restorations are subjected to failures and dislodgements. These are among the main problem in the dentistry.¹ Amalgam being an old restorative material has been used extensively in the posterior dental fillings. It has also limited use in the anterior teeth having class III cavities in the areas which are not visible during smile or talking. The development of resin composite has made it possible to be used successfully in the anterior as well as posterior teeth.² The longevity of the resin composite has been considered as greater than amalgam. During amalgam restoration, only the macromechanical means and measures are responsible for the retention of restorative material into the cavity.

While in case of resin composite the micro mechanical retention helps to retain the composite.³ The amalgam is successful equally in the smaller as well as larger complex tooth preparations. Amalgam being a hydrophobic material provide ease for the manipulation even in the areas where the field isolation is difficult to achieve. While resin composite requires strict field isolation. Although the longevity of the restoration depends upon a number of factors like skills of the operator, type of restorative material used and the basic techniques applied to preparation yet the main reasons for the restoration failures are the recurrent caries, tooth fracture and the fracture of the main bulk of the restorative material.²

A number of restorative materials have been developed with improved strength and aesthetics. Although the amalgam has been used as a restorative material in the posterior teeth since long yet there has always been a focus of the investigators to develop a material having good strength as well as esthetically acceptable suiting all the requirements. Such types of materials that are esthetically acceptable, have and good acceptance by the patients and are materials of choice for restoration. There are certain controversies that are being related to the amalgam. One of them is mercury

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toxicity and esthetically non appealing.⁴ The other disadvantage include the lack of bonding to the tooth surface, weakening of the tooth structure and need for the lining material. The currently available other restorative materials not only have the bonding capabilities but they also seldom require a lining.⁵ Resin composites are tooth coloured and have good strength. They are used extensively as fissure sealant, direct and indirect restorations and bonding certain ceramic restorations.^{5,6} Despite the merits of resin composite the polymerization shrinkage is still considered a major issue.^{6,7} Bonding to the enamel is a positive point regarding to success. The same is also true for the dentine. There are certain problems associated with dentine due to its wet nature. However the enamel margin is important for the restorative adhesion, because most of the retention is achieved by the enamel margins.⁸ In case of amalgam restorations there is no bond and micro gaps are created between the tooth restoration interface. These gaps are responsible for the colonization of the bacteria and caries recurrence. The behaviour of the resin composite is better as compared to the amalgam in terms of micro gaps.³ These newly emerged resin composites represent a groundbreaking alternate to amalgam.

MATERIALS AND METHODS

This perspective study was carried out at Department of Operative Dentistry, Dental Section, Punjab Medical College Faisalabad and Fatima Memorial Hospital College of Dentistry, Lahore from October 2016 to March 2017. Total 164 outdoor patients were selected having age between 20-30 years. 110 patients were males and 54 patients were females. The study proceeds the following steps outlined below. A complete medical and dental history was recorded before the operational procedures. The radiographs were taken to assess the depth of the carious lesions and periodontal health. Only mandibular molars were selected having Black's class 1 carious lesion. All the restorations were performed following standard parameters of isolation. 78 patients received the resin composite restoration while 86 patients got silver amalgam fillings. The cavity was prepared with the high speed air turbine using copious irrigation of water. Isolation was achieved by the use of cotton rolls and wafers. For resin composite, etching was done, washed and then adhesive was applied. Then restorative composite was packed into the cavity and light cured. The design of cavity was made considering the C-factor to avoid polymerization shrinkage. For silver amalgam fillings, the outline of the cavity was prepared following Black's rule of cavity preparation. All the unsupported enamel was removed to avoid marginal fracture of the tooth. After the restorations, the follow up was made after six months to evaluate the marginal integrity and thus restoration success. The marginal integration of the restorations

was assessed by the criteria used by Cvar and Ryge. This criteria has three categories i.e. Alpha, bravo and Charlie. Statistical significance was analyzed by using SPSS 16.

RESULTS

The Chi square statistic value obtained with degree of freedom (df) 1 is 10.3385. The p- value is 0.001303. The result is significant at $p < 0.05$. The value in the chi square chart is 3.841. While our statistical value is 10.3385 which is remarkably higher than the value in the chi square table. So we can say that there is significant difference among two modes of treatment (Tables 1-2).

Table No. 1: Frequency and percentage of procedures

Restorative material	Successful (Alpha)	Failure (Bravo/Charlie)	Total
Resin composite	67	11	78
Silver amalgam	55	31	86
Total	122	42	164

Table No.2: Contingency table with expected values and Chi square statistic for each cell

Restorative material	Successful	Failure
Resin composite	58.02 (1.39)	19.98 (4.03)
Silver amalgam	63.98 (1.26)	22.02 (3.66)

DISCUSSION

The resin composite has been used extensively due improved marginal integrity and the esthetics. It almost fulfils the esthetic demands of the patient. This quality of the material ensures a good patient satisfaction. There is a little failure observed with this material. There is vast amount of literature available on this material. This failure is mostly due to the wear and is related to the bruxismic patients.^{9,10} These demerits have drawn the attention of researchers towards a new better innovation. In the study the first group of resin composite restoration showed a good marginal adaptability i.e. 85.89% fell into Alpha criteria after six months. The other 14.10% restorations categorized as having compromised marginal integrity. It is plausible that a number of limitations could have influenced this category. Out of these, 7 patients (63.30%) were in Bravo and remaining 4 patients (36.36%) were in Charlie category.

According to Gianordoli et al¹¹ the resin composites showed acceptable marginal integration even after two years. current study supports this practical outcome being not a far cry. The same researcher also concluded that two different resin composites were clinically

satisfactory after one year.¹² The cavity margins were bevelled slightly to improve the sealing effect of the adhesive. But at the same time maximum conservation of the tooth structure was preserved. However unsupported enamel is liable to fracture and on account of this fact it was removed. Soliman et al¹³ is correct to argue that in the larger class II cavities bevelling should not be done and is no longer recommended. Perhaps this is due to the increased bulk of the restorations that failed to reproduce a well integrated margin. However in the smaller class I cavities a slight bevelling is allowed to enhance the marginal integrity.

In case of silver amalgam restorations 55 patients (63.95%) were declared as successful and 31 patients (36.05%) were having compromised marginal integrity. Out of these unsuccessful restorations, 19 patients (61.29%) were in Bravo category and the rest 12 patients (38.70%) were in Charlie category. Any significant difference was not observed in compliance to the gender basis. A review of the literature shows that the longevity of the restoration depends on quality and technique of operator, socioeconomic factors such as income, type of dental service and demographic factors.^{14,15} Recent research has also shown the satisfactory results of the hybrid materials and that the composites can be used successfully in the posterior teeth.¹⁶

It has been widely observed that the failure of the restorations is mainly due to the recurrent caries. This recurrence is the main etiology of the restorations to fall to pieces. There is further progression of caries with the invasion of bacteria into the crevice and so responsible for the decay of tooth. The past research pertaining to the restoration failures in resin composites exhibits secondary caries, caries risk factors the presence of lining and bruxism.¹⁷ Repair of the composite restoration has also been gaining popularity these days. This repair is able to increase the longevity of the restoration provided the patient, operator and the material is taken into account.^{18,19}

There are a number of factors that influence the performance of the restorations. These include experience of the operator, position of the tooth in the arch, restoration design, size and age of the patient.^{20,21} The use of amalgam is mainly indicated in the larger cavities and where the isolation is difficult to achieve. As far as the composite restoration is considered, it is cumbersome, costly and highly technique sensitive. In these conditions the amalgam can be used effectively.²² The onset of the caries along the margins of the amalgam is more as compared resin composite due to the non adhesive behaviour of the material. Despite these amalgam is successful in the smaller restorations and allows more tooth conservation.²³

CONCLUSION

Composite restorations are evidently more successful in terms of marginal integration and restoration longevity as compared to the conventional silver amalgam

restorations. This feature and thus the whole restorative technique is not a brain surgery. The material has an adhesive nature which makes less chances of caries recurrence and restoration fracture. Despite certain demerits of the adhesive restorations, the next decade is likely to see further advancements in the bio materials.

Author's Contribution:

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