ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 11, pp.42273-42275, November, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

EVALUATION OF CLINICAL PERFORMANCE OF GLASS IONOMER RESTORATION IN A RESIDENTIAL SCHOOL CHILDREN–12 MONTH FOLLOW UP STUDY

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ARTICLE INFO

Article History:
Received 09th August, 2016
Received in revised form
20th September, 2016
Accepted 18th October, 2016
Published online 30th November, 2016

Key words:

Glass Ionomer Cement,
Restoration, Intactness.

ABSTRACT

Glass ionomer Cement is the most commonly used restorative material in pediatric dentistry because of its desirable properties such as anticariogenic action due to fluoride release, biocompatibility, chemical bonding to tooth structure and ease of manipulation. A 12 month follow up study was done to evaluate the success and failure rate of glass ionomer restoration in various types of cavities in different teeth. Children of age group 6-7 years having similar diet, life style, water supply and under supervised oral hygiene maintenance were selected from a residential school for this study. Primary oral health education to all children was given prior to the start of study and duration of follow up was standardized.

Citation: Dr Shilpi Tiwari, Dr B Nandlal and Dr Shivani jandial, 2016. "Evaluation of clinical performance of glass ionomer restoration in a residential school children –12 month follow up study", *International Journal of Current Research*, 8, (11), 42273-42275.

INTRODUCTION

Restorative procedures constitute a major proportion of clinical pedodontic practice. For many decades amalgam has been the standard restorative material in pediatric dentistry. However, the detrimental environmental effects of mercury and debates on possible health effects of amalgam have resulted in reduction of its use. The development of glass ionomer cement made available a restorative material with long term adhesion to tooth structure. Since then it has been commonly used in pediatric dentistry with its desirable properties such as anticariogenic action due to fluoride release, biocompatibility, chemical bonding to tooth structure and ease of manipulation. Majority of clinicians used glass ionomers as all purpose material in primary dentition in which their adhesive property is used to minimize tooth preparation and less chances of developing secondary caries due to fluoride release (Welbury *et al.,* 1991). Inspite of having so many advantages glass ionomer cement has its drawbacks of having poor mechanical property to be used in posterior teeth. There have been very few clinical trials on quality and longevity of glass ionomer restoration in primary teeth and the reported failure rates for class II glass ionomer restorations in primary teeth have been very high possibly because of bulk fracture or lost fillings.

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Therefore the increasing use of glass ionomer in primary teeth may be largely on pediatric dentist faith in cariostatic effect of material due to prolonged fluoride release (Qvist *et al.,* 1997). Thus the aim of this study was to evaluate the clinical performance of glass ionomer restoration in class I and Class II Cavities and to compare the success rates among these groups.

MATERIALS AND METHODS

Study design comprises 50 Children of age group 6-7 years having similar diet, life style, water supply and under supervised oral hygiene maintenance. Primary oral health education was given prior to the start of study. The carious lesions were diagnosed by dental probing. Diagnosed carious lesion were restored with posterior packable glass ionomer cement and 12 month follow up evaluation of restored teeth was carried out. Inclusion and exclusion criteria for restoration placement: Size 2 untreated carious lesion as described by MOUNT and HUME (1998) on primary molars were included for the study. The exclusion criteria were teeth with recurrent decay, Dislodged restoration, Teeth with pain and other associated symptoms, def score more than eight (Graham *et al.,* 1998)**.** Having been assessed as suitable for inclusion in the trial 50 patients were treated which included a total of 128 teeth. Before the start of study operators were well trained for the standardized treatment procedure.

Table 1. Intactness based on method of restoration at 12 month follow up

Method	No of restored teeth	No of teeth examined at follow up	Intactness no	Intactness %
Class I	68	60	55	91.66%
Class II	60	60	40	66.66%
Total	128	120	95	79.16%

Table 2. Intactness based on tooth type

Type of teeth	No of restorations examined at follow up	Intactness no.	Percentage of intactness
E	50	42	84.00%
D	70	53	75.71%

Table 3. Intactness of class II restoration based on type of cavity

Method	Tooth type	Teeth examined at follow up	Intactness No	Percentage of intactness
class II MO	E	10	06	60.00
28	D	18	12	66.66
Class II DO	E	12	08	66.66
22	D	20	14	70.00

The selected teeth were isolated with saliva ejector and cotton rolls, class I, II cavity were prepared to receive glass ionomer cement. The Glass ionomer cement was mixed as per the manufacturer's instructions and placed into the prepared cavity. The surface was covered with Mylar strip and occlusal anatomy recreated with plastic filling instrument through surface matrix. Material was allowed to set for 5 minute (from the time of mixing) before the matrix was removed. Any excess was removed and morphology of the restoration was perfected using sharp hand instrument and there surface recoated with Vaseline after finishing (Welbury *et al.,* 1991). Restored teeth included 68 class I and 60 class II. Follow up was done after 12 months and Success rate was measured in terms of intactness (Table 1).

Statistical analysis

After observation period of 12 months, the obtained data was tabulated in Microsoft excel and Chi square statistics was applied for comparison of baseline data and 12 months results. Statistical comparison of intactness between class I and class II, among class II between MO and DO was performed.

RESULTS

A total number of 8 teeth were censored (censored due to withdrawal of admission). A further 8.33% of class I and 33.33% of class II were recorded as failure because the restoration needed repair/ replacement / undergone pulpal complications or fracture. Comparison of Class I and class II restoration shows proportion of intactness for class I 91.66% and for class II 66.66% showing significant difference in intactness with p value <0.001 (Table 1). When comparing intactness of restored teeth on primary first molar (D) and primary second molar (E), there was a significant difference between two (intactness for D 75.71% and for E 84%) with p value < 0.001 representing higher failures among class II (Table 2). Among class II comparison of MO and DO Cavities, the proportion of intactness for MO-on E 60.% &on D 66.66%, for DO- on E 66.66% & on D 70% the difference was not statistically significant among groups with P Value >0.05 (Table 3).

DISCUSSION

The requirement for a restorative material in primary teeth are rather different from those in the permanent dentition. Deciduous teeth by their nature are temporary with maximum life span of 8-9 years. Consequently, a restoration have to last a limited time in oral environment, thus it has been postulated that glass ionomer cements are capable of fulfilling these requirements. In addition there are two potential advantages associated with the use of these materials in deciduous dentition. Adhesive material would allow less destructive cavity preparation and long term fluoride release will provide localized cariostatic environment including tooth itself and other adjacent tooth surface for class II restoration (McLean and Wilson, 1977; Saito, 1979; Plant *et al.,* 1977). This study comprised of 50 children from a residential school in which 128 primary posterior teeth were restored with GIC. The children of residential school were selected for the study so as to standardize diet, life style and supervised oral hygiene practices. It is remarkable that standard deviation for failure of restoration by any operator was not significant, indicating GIC as least sensitive material to handle. Use of current clinical criteria and treatment practices together with discussion during the whole project further reduced the inherent problem of standardized clinical studies. Clinical trials investigating the longevity of glass ionomer restorations in primary molars are mostly short-term studies of less than three years. The longest survival rates for glass ionomer restorations are in low stress areas such as Class III and Class V restorations (Mount, 1993). In a study by Vlietstra and others reported that 75% of conventional glass ionomer restorations in primary molars were intact after one year, and that margin adaptation, contour and surface finish were all satisfactory (Vilestra *et al.,* 1978). In our study 91% class I and 66.66% class II were intact in primary molars after one year follow up indicating relatively higher failure rate for class II Glass ionomer restorations. Study by Ostlund and others reported a high failure rate for class II glass ionomer cement in primary molars of about 60% after one year (Ostlund *et al.,* 1977). Fuks and others studied the clinical performance of a glass ionomer cement in Class II restorations in primary molars.

Only nine of 101 glass ionomer restorations met all quality criteria after one year. The higher rate of failure for Class II glass ionomers could be attributed to their relative lack of strength and low resistance to abrasion and wear. Conventional glass ionomer cements exhibits low flexural strength but high modulus of elasticity, and are therefore very brittle and prone to bulk fracture (Shiu-yin Cho and Ansgar C. Cheng, 1999). In the present study it was noticeable that failure for the Class I restoration were mainly due to development of secondary caries and failure of Class II restoration was mainly because of fractured restoration or lost restoration. Fractures mainly included bulk fracture as well as marginal fracture or tooth fracture.

Conclusion

This study gives an overview on clinical performance of glass ionomer cement in primary teeth .The experimental design of this study provides the realistic basis for the evaluation of appropriateness of using conventional glass ionomer in a child patient under the conditions in prevailing daily general clinical practice. Based on the 12 month follow up results of this study it can be concluded that conventional glass ionomer is not an appropriate material to be used in class II cavities of primary teeth. Although it can be used quite well for class I without serious consequences for the longevity of treatment. Further research in improving its mechanical properties by incorporating various reinforcing particles should be carried out to develop a material which can be an ideal restorative material for high stress bearing areas and further clinical studies are required in primary molars to confirm the efficacy of reinforced glass ionomers with improved strength.

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