

Comparison of the Success and Longevity of Glass Ionomer Cement In Relation To Amalgam Restorations in Primary Molars – A Retrospective Study

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Abstract

Background: Dental caries has been a highly prevalent disease in the world, representing the most common infectious disease in the paediatric population and restoration become a major treatment delivered in them. Today, the pediatric dental practitioner has multiple choices with many materials from which to select for each restorative situation. However pediatric practice of restoring class II is challenging due to the time tested failure of amalgam at isthmus region– explained due to improper depth high restoration sharp axiopulpal line angle and overcoming, most important is the lack of bulk due to primary tooth anatomy which made clinicians stick to the newer tooth coloured restorative materials but the limitations of lack of strength, excessive salivation also hampers the success of these material. Fractured or failed restoration could lead to early involvement of pulp and

loss of teeth which can cause a lot of problem. So our study was done to assess the best restorative material as far as success and longevity is concerned.

Aim: This study aims to compare the success longevity of glass ionomer cement and amalgam restoration in class II on primary molars.

Settings and Design: The study is a retrospective hospital based study

Material and Methods: One hundred twenty children aged 5-9 years who had obtained treatment from department of pedodontics and preventive dentistry, KVG Dental College and hospital were selected for the study. Children having either glass ionomer cement or amalgam restoration done by postgraduates were recalled for the study and the children were divided into two groups based on the type of restoration.

GROUP 1- Glass ionomer cement restoration

GROUP 2- Amalgam restoration. After that comparison is done using evaluation criteria.

Statistical Analysis: The data will be statistically analyzed using Mann Whitney test.

Results: The results showed a success percentage of 44.2% for glass ionomer cement and 73.1% for amalgam in fracture resistance, a success percentage of 67.3% for glass ionomer cement and 94.2% for amalgam in anatomic form, a success percentage of 80.8% for glass ionomer cement and 76.9% for amalgam in marginal intergrity and a success percentage of 86.5% for glass ionomer cement and 78.9% for amalgam in case of secondary caries.

Conclusion: Fracture rate is high in glass ionomer cement compared to amalgam. This is mainly due to poor strength.

With proper modification in cavity, proper isolation amalgam has high success longevity rate in primary tooth than glass ionomer cement .Amalgam is a better material for Class-II cavities of primary molars having limited life span in the mouth

Keywords: Amalgam, Glass Ionomer Cement, Success and Longevity

Introduction

Dental caries has been a highly prevalent disease in the world, representing the most common infectious disease in the paediatric population.¹ Today, the dental practitioner has multiple choice with many materials from which to select for each restorative situation. Each material has its own pros and cons and its practical application is left to the clinician decision depending on the case.²

Over the years esthetic restorations like glass ionomer cement have taken over the amalgam for its advantages like fluoride release and chemical bonding which seemed to overcome the disadvantages of amalgam like mercury toxicity and bulk requirement of material which calls for a

bigger cavity preparation. But glass ionomer cement is not free of limitations; like it is technique sensitive, lack of strength and moisture contamination. Failing which leads to fractured or failed restoration which could proceed to early involvement of pulp and loss of teeth with lot of problem like loss of space, speech problems and psychological impact in children. But time and again amalgam always has a plus point of its strength and longevity provided all the modification are done to avoid isthmus keeping in mind the anatomical limitation of primary teeth.³

In order to overcome this doubt regarding which is the best choice of material in primary dentition our retrospective study was conducted to judge as far as longevity and durability of different restorative material in primary teeth.

Aims and Objectives

Aims

This study aims to compare the success longevity of glass ionomer cement and amalgam restoration.

Objectives

- To evaluate the success longevity of amalgam restoration in primary molar
- To evaluate the success longevity of glass ionomer cement restoration primary molar
- To compare the success longevity of amalgam restoration with glass ionomer restoration in primary molar

Material and Methods

The present study was a retrospective hospital based comparative study conducted in the Department of Pedodontics and Preventive Dentistry, KVG Dental College and Hospital, Sullia, India. A total of 120 children in the age group of 5-9years with at least one class II restoration either glass ionomer or amalgam done by the

postgraduates with proper cavity modification were selected based on inclusion and exclusion criteria.

Inclusion criteria

1. Children who fall in the age group of 5-9years
2. Children who have obtained class II restoration restored with either glass ionomer cement or amalgam restorative material.
3. Children who have obtained class II restorations previously over a period of 1to 3 years who were recalled for assessment.
4. Children who are healthy and cooperative

Exclusion criteria

1. Teeth with restoration other than glass ionomer cement and amalgam
2. Presence of intraoral or extraoral swelling.
3. Patient with high bruxism.
4. Medically compromised children.

The samples were divided into 2 groups:

Group 1: sixty teeth restored with Glass ionomer cement in primary molar

Group 2: sixty teeth restored with Amalgam in primary molars.

Methodology

After assorting the patient who is having the restoration of either glass ionomer or amalgam from the OP register. The patient is recalled for the examination. It is make sure that all the restoration was done with proper modifications by postgraduates in KVG dental college. The teeth to be examined were air dried and isolated using cotton rolls. Clinical examination of teeth is done using dental explorer and mouth mirror and evaluation is done using USPH Criteria (table 1)⁴. The USPHS is the most commonly used system in the literature used in studies that have compared restorative material in primary teeth. Mann-Whitney test was carried out to find out if there was any

significant difference between the scores, obtained for the two restoration.

Table 1: Rating system and criteria for evaluation of clinical characteristics of the restoration.

| VARIABLE | Alfa (A) | Bravo (B) | Charlie (c) |
|--------------------|--|---|---|
| FRACTURE | Restoration is intact and fully retained. | Restoration is partially retained with some portion of the restoration still intact | Restoration is completely missing. |
| ANATOMIC FORM | Continuous restoration with existing anatomical form | Restoration is not in continuity with the existing anatomical form ; the discontinuity is insufficient to expose dentin or lining | Sufficient loss of the restoration has occurred to expose dentin or lining ; restoration needs to be replaced |
| MARGINAL INTEGRITY | The explorer does not catch when drawn across the surface of the restoration toward the tooth, or, if the explorer does not catch, there is no visible crevice along the periphery of the restoration. | Visible crevices along the margin into which the explorer will penetrate or catch | The explorer penetrates crevice defect extended to the dento-enamel junction. |
| SECONDARY CARIES | No evidence of caries | | Evidence of caries along the margin |

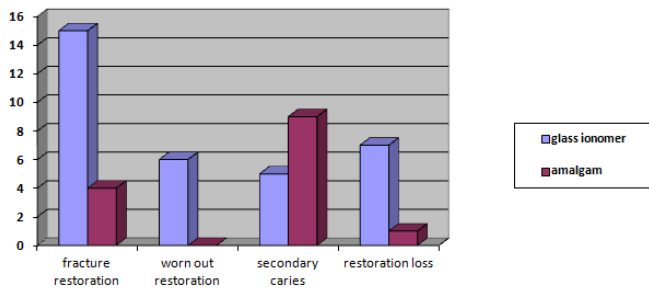
Results

In the present study, a total of 120 restorations were evaluated, 60 amalgam restoration and 60 glass ionomer restoration. Out of the restoration evaluated the reasons for the failure included, fracture of the restoration, wearing of the restorative material, secondary caries and endodontic treatment. In Table 2and table 3 failures for each of restoration are shown. All restorations given an ‘Alpha’ rating were regarded as success. The success of the restoration is shown in table 4. Endodontic treatment was recorded as a reason for the failure of the restoration, and then the restoration was excluded from the following evaluation, because the USPHS criteria does not contain this clinical characteristic.

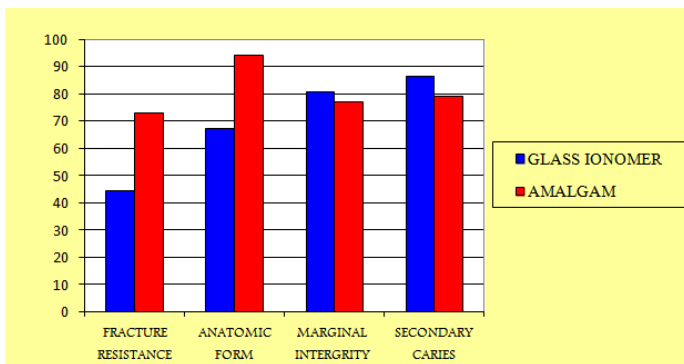
Table 2

| Reason for failure | Glass ionomer | Amalgam |
|--------------------------|---------------|---------|
| Fracture of restoration | 15 | 4 |
| Worn restoration | 6 | 0 |
| Secondary caries | 5 | 9 |
| restoration loss | 7 | 1 |
| Total failed restoration | 33 | 14 |

Graph: Failure Rate



Graph: Success in Percentage



The results showed a success percentage of 44.2% for glass ionomer cement and 73.1% for amalgam.

Our study revealed that there was a significant difference between glass ionomer cement and amalgam with respect to fracture resistance during the evaluations ($p < 0.05$).

The results showed a success percentage of 67.3% for glass ionomer cement and 94.2% for amalgam.

Our study revealed that there was a significant difference between glass ionomer cement and amalgam with respect to anatomic form during the evaluations ($p < 0.05$).

The results showed a success percentage of 80.8% for glass ionomer cement and 76.9% for amalgam.

Our study revealed that there was no significant difference between glass ionomer cement and amalgam with respect to marginal intergurity during all the evaluations ($p > 0.05$).

The results showed a success percentage of 86.5% for glass ionomer cement and 78.9% for amalgam.

Our study revealed that there was no significant difference between glass ionomer cement and amalgam with respect to secondary caries during all the evaluations ($p > 0.05$).

Discussion

In this study it was found out that longevity of restoration is better for amalgam compared to glass ionomer materials which were in contrast to studies by Holland et al⁵. It may be due to fact that better cavity preparation and isolation techniques were followed which resulted in longer survival rate in case amalgam restorative material. In this study even though the difference between mean age values of the amalgam and glass ionomer were not statistically significant, survival rates and average survival times increased in direct proportion with age which is in contrast to the studies done by Barr-Agholme and Tran et al who stated that survival of restorative material was not affected by patient's age.^{6,7}

In this study it was found out that failure of restoration is significantly higher in caries risk patients which is in accordance with studies done by van de Sande et al⁸. It was found out that one of the main reasons for restoration replacement is secondary caries in permanent teeth and fractures or complete loss of restoration in primary teeth.⁹ It maybe the reason why fracture of tooth or broken restorations are emphasized for more clinical care for the preservation of oral health in primary dentition. In case of bruxism the factors influencing the occlusal loading comes to play an important role fatigue development in the tooth-restoration complex so bruxing were not considered for our study.¹⁰

In this study it was found that most of the failure is due to fracture of restoration and it was found that it was in glass ionomer cement when compared to amalgam. This may be due to less compressive strength of the glass ionomer cement. The fracture in amalgam restoration maybe mainly due to isthmus fracture in Class II preparations

particularly when the proximal outline flares out buccally and lingually, stressing the material at these margins. If the proximal box is large and the isthmus is narrow, a fracture could eventually occur. Conversely, if the isthmus is too large, a great deal of tooth material is wasted, the cusps are weakened and the pulp horns are endangered.¹¹ But when comparing the fracture rate it was less for amalgam, it may be due to proper modification in cavity preparation which provide additional retentive and resistance form for the restoration to be retained in the tooth.

In this study about anatomic form the results showed a success percentage of 67.3% for glass ionomer cement and 94.2% for amalgam and the results showed a significant difference between glass ionomer cement and amalgam with respect to anatomic form during the evaluations ($p < 0.05$). Loss of anatomic form as a result of loss of restorative material from the occlusal surface and it was found that the anatomic form of the restoration was distorted in glass ionomer cement than in amalgam due to the wearing of the restorative material during occlusal function in children.

In this study the recurrent caries is more in amalgam compared to glass ionomer cement but the results results showed a success percentage of 86.5% for glass ionomer cement and 78.9% for amalgam which are not statistically significant. Secondary caries is less in glass ionomer cement when compared to amalgam and long term fluoride release from GIC could be the reasons for lower incidence of recurrent caries compared to amalgam restoration.

In this study longevity of amalgam restoration is better than glass ionomer restoration so glass ionomer cannot be considered as an alternative for amalgam which is in accordance with studies conducted by Qvist et al¹². Based on this study it was found out that amalgam was the better

material of choice for restoration of Class II lesions in primary molars which was in accordance to Survey of California Pediatric Dentists¹³. Amalgam is the most common material used for Class II restorations similar to observations by Christensen in a 2001 paper¹⁴. The limitations of study was that the restoration was not done by single operator. Further scope of research can be focused on conducting research in larger population, also by single operator.

Conclusion

Many options exist to repair carious primary teeth, but there is insufficient controlled, clinical data to suggest one type of restoration is superior to another. Operator preferences, esthetic demands by parents, the child's behavior and moisture control are all variables which affect the decision and ultimate outcome of whatever restorative material is chosen. Cognizance of specific strengths, weaknesses and properties of each material will enhance the clinician's ability to make the best choice of selection for each individual situation

Within the limits of the present *retrospective* study we conclude that:

- Fracture rate is high in glass ionomer cement compared to amalgam, this is mainly due to poor strength.
- With proper modification in cavity preparation, proper isolation amalgam has high success longevity rate in primary tooth
- Amalgam is a better material for Class-II cavities of primary molars having limited life span in the mouth

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