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Comparison of Post-Operative Sensitivity of Resin Modified Glass Ionomer and Composite Restorations in Deciduous Molars

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ABSTRACT

Objective: To compare the post-operative sensitivity of Resin Modified Glass Ionomer and composite restorations in class II cavities of deciduous molars on 1st, 7th and 30th day.

Study Design: Prospective analytical study.

Place and Duration of Study: Operative Department of Armed Forces Institute of Dentistry, Rawalpindi, Pakistan from Jan 2019 to Jul 2019.

Methodology: A total of 300 class II cavities of deciduous molars of 100 cooperative children ranging from ages 4 to 10 years were selected. Half of the cavities were restored with RMGI and the rest were restored with Composite. The post-operative sensitivities on taking cold food and biting were jotted down on the proforma with patients' bio data after 24 hours, 7 days and 30 days interval.

Results: The post-operative sensitivity results for composite and Resin Modified Glass Ionomer on 1ST, 7TH and 30th day were 16.7, 6.7%, 4.0% and 15.3%, 6.7% ,3.3% respectively with no statistical difference. The sensitivity for both materials decreased with passing time.

Conclusion: Both materials, Resin Modified Glass Ionomer and composite, demonstrated no significant difference in post-operative sensitivities on any of the days. Both proved to be the materials of choice in pediatric patients.

Keywords: Composite restoration, Pediatric dentistry, Postoperative sensitivity, Resin modified glass ionomer.

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INTRODUCTION

Dental caries is a vastly prevailing condition that remains a global health issue affecting billions of adults and children.[1,2] Non cleansable active carious lesions require active intervention by the dentist in order to prevent pain and further complications of the non salvageable teeth. The restoration of the deciduous teeth should remain put till the exfoliation of these teeth. The main goal of restorative procedures in deciduous dentition is to prevent plaque, food entrapment, extension of the carious lesion to the dentin pulp complex causing pain and early loss of teeth.[3]

In pediatric dentistry there are a number of restorative materials being used by the dentists like Composite, Resin Modified Glass Ionomers, Compomers, Giomers, Glass Ionomer Cement and even Amalgam. In children with high caries risk, fluoride releasing compounds are used to prevent secondary caries.[4] Amalgam as a dental restoration has been used for the past 150 years which was later replaced after the invention of composites. The tooth colored feature along with no hazard of mercury increased the use of composite for restorative procedures.[5] Dentists started using Glass ionomer cements in primary teeth restorations in the late 1970, which was then replaced by resin modified glass ionomer due to its increased and improved physical and chemical properties.[5,6] They maintain the clinical benefits of the conventional glass ionomer with an improvement over the original material such as chemical adhesion and fluoride release.[7,8]

With advancing technology, new and improved glass ionomers are being manufactured but the scientific literature lacks its long term clinical and biological evaluation as compared to composites on the posterior primary dentition. The main differences between the two materials lies in the fluoride releasing properties, lower flexural strength and bonding to the tooth structure of RMGIC.[9] Post-operative sensitivity is seen in restorative materials especially with deeper cavities.[5] Postoperative sensitivity can be defined as discomfort in a tooth with a stimulus like heat, cold or

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mastication that occurs after the placement of restoration. This nature of pain is thought to be related to polymerization shrinkage. When the gaps between the restoration and dentin fill with fluid and go through various stimuli, the restorative material and tooth deform causing the collected fluid to flow down the dentin tubules causing sensitivity.[9] This sensitivity can be measured by verbal contact with the patient or manually checking for the symptoms chair side.[10] However the post-operative sensitivity decreases with passing time period in many studies.

In this study we compared post-operative sensitivity with Composite and Resin Modified Glass Ionomer on different days in deciduous teeth. The main objective of this study was to find a better treatment option for the deciduous teeth since pediatric patients cannot be treated multiple times for the same tooth with different modalities as it can cause disturbed schedule of the parents, missed school days, annoyance to the child and worsening of the tooth condition. After thorough literature review, no such study was found to be conducted locally to our best knowledge.

METHODOLOGY

This study was conducted in the Operative dentistry department of Armed Forces Institute of Dentistry, Rawalpindi Pakistan from January 26th to July 25th 2019. This research was approved by the Ethical Committee of Armed Forces Institute of Dentistry under the IRB number I-84/18.

Inclusion Criteria: children of both genders ranging from age 4 to 10 years were randomly selected by convenience sampling. Maxillary and mandibular deciduous molars with class II carious lesions were included in the study.

Exclusion Criteria: Patients with teeth with irreversible pulpitis, peri-apical periodontitis, acute or chronic abscess with or without draining sinus or teeth requiring pulpectomy were excluded from the study. Mentally and physically retarded patients were not included.

An informed consent was taken from the guardians of the patients. A total of 300 teeth were selected for the study with a standard error of 0.03 and relative error of 5.77 using National Statistics Services Calculator.[11] The selected teeth were randomly divided into two equally numbered Groups containing 150 teeth each (Group I and Group II). In Group I teeth were restored with TPH spectrum hybrid resin composite (dentsply) where as in Group II light cured resin modified Glass Ionomer with the trade name of Vitremer 3M ESPE (manufactured in USA) was being used as a restorative material. The patients were blinded to the type of the material being used.

Complete caries removal was done and cavity preparation was performed with diamond burs using water coolant constantly to prevent over heating of the tooth structure. No base material was applied to any of the teeth. Sectional matrixes with wooden wedges were used in all the teeth prior to being restored. For Group I 35% phosphoric acid etchant was being used along with Spectrum mono bond adhesive. The adhesive was applied with a micro brush, air sprayed gently to spread the product properly followed by light curing for 20 seconds with blue LED light (3M ESPE). Composite was being applied in 2 mm increments and light cured until the whole cavity was being restored. After occlusal adjustments, the restoration was polished with polishing tips (dentsply). Proximal finishing and polishing was being done by finishing polishing strips. In Group II, Vitremer (3M ESPE manufactured in USA) powder liquid was mixed with equal parts of powder and liquid in 30 seconds and then placed in the disposable vitremer cones with plungers for placement at the site of cavity. The restorations were then cured for 40 seconds. In the end they were polished with soflex discs.[12,13]

The data was recorded on the specially formulated form having the bio data of the patient along with the columns of evaluation of restoration at scheduled three follow ups. Contact numbers of the guardians were duly noted for the follow up. Patients were contacted on days 1, 7 and 30 postoperatively. They were questioned in terms of the presence or absence of sensitivity including cold (ice cream, cold drinks) or chewing. For consistency purposes, both procedure and follow up of patients for sensitivity responses were done by only one dentist throughout the study. Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Quantitative variables with normal distribution were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics. The p value ≤ 0.05 was statistically significant.

RESULTS

All patients were available for follow up upon contact on 1st, 7th and 30th post operative day. In Group I, 16.7% of the restored cavities showed sensitivity after 1 day among which nineteen (12.7%) teeth were sensitive to cold where as six were sensitive on chewing. Similarly, on 7th day, 10(6.7 %) teeth were sensitive out of which six were sensitive to cold whereas, four teeth were sensitive on chewing. On the last follow up day Group I, only 5(3.3%) teeth showed sensitivity with five and one teeth sensitive to cold and chewing respectively. In similar manner, the Group II restorations showed 23% post operative sensitivity on the 1st follow up with seventeen and six restored teeth sensitive to cold and chewing respectively. On 7th day, 12 teeth were sensitive with 9 and 3 restored teeth sensitive to cold and chewing respectively (Table-I). On 30th post operative day, Group II showed 3.3% sensitivity with three and two teeth sensitive to cold and chewing respectively. The comparison of post operative sensitivity in either Group was analyzed to be statistically insignificant in all the follow ups (Table-II).

Table-I: Frequency of Sensitivity in Response to Different Stimuli in test Subjects (n=300)

Material	Composite (n=150) Frequency (%)		RMGI (n=150) Frequency (%)	
Stimulus	Cold	Chewing	Cold	Chewing
Day 1	19(12.7)	6(4.0)	17(11.3)	6(4.0)
Day 7	6(4.0)	4(2.7)	9(6.0)	3(2.0)
Day 30	5(3.3)	1(0.7)	3(2.0)	2(1.3)

RMGI= Resin Modified Glass Ionomer

Table-II: Relation between Post-Operative Sensitivity on Different Days with the Types of Material used (n=300)

Days	material	Post op sensitivity	Odds Ratio (CI)	Relative Risk (CI)	*p*-value
1	Composite	25(16.7%)	0.929 (0.45 – 1.91)	0.987 (0.87 – 1.12)	0.607
	Resin Modified Glass Ionomer	23(15.3%)	0.66 (0.329 – 1.325)	0.927 (0.811 – 1.060)	
7	Composite	10(6.7%)	0.634 (0.24 – 1.677)	0.963 (0.884 – 1.049)	0.113
	Resin Modified Glass Ionomer	12(8.0%)	0.894 (0.337 – 2.371)	0.991 (0.911 – 1.077)	
30	Composite	6(4.0%)	1.06 (0.257 – 4.33)	(0.949 – 1.058)	0.995
	Resin Modified Glass Ionomer	5(3.3%)	OR 0.51 (0.143 – 1.819)	0.969 (0.908 – 1.034)	

DISCUSSION

In the past decades, tooth colored adhesive restorations have greatly substituted amalgam owing to its health hazards and non-conservative cavity prep with more tooth structure loss. Use of these resin based materials as restorations have shown post-operative sensitivities in various patients.[13,14] Certain studies show that these post-operative sensitivities are highly dependent on the operator's skill as well as the dentinal thickness beneath the restorations.[15] Our study was thus performed by a single dentist , well versed with the procedure, material handling and safety , thus operator related complications and failure were controlled.

In our study, post-operative sensitivity in composite and resin modified glass Ionomers in Class II restorations of deciduous molars were compared on different time frames. After 24 hours of placement of composite 12.7 percent of the teeth presented with sensitivity to cold and 4% were sensitive on mastication. Similar results were found in a study conducted in Brazil in 2007 on adults with increased frequency of sensitivity in class II restorations as compared to class I.[14] Our study showed decreased frequency of sensitivity in the composite restorations on the 7th and 30th day with 6.7 % and 4% teeth sensitive to cold and biting combined, which shows similar results like the study conducted in turkey by Muhammet Kerim Ayar that revealed decrease in sensitivity after composite restoration with passing time.[15] Similar clinical results were demonstrated by Alf Briso *et al*.[14] which showed statistical decrease in the occurrence of sensitivity after thirty days. They compared different cavity classes and got the same result as stated previously. A recent study done in Germany by Sabbagh *et al*. on primary molars revealed that composites showed good hypersensitivity results over a period of one year with similar results to our study.[16]

The second Group of class II cavities received resin modified glass ionomer restorations in our research. Group two showed 15.3% sensitivity on day one with 11.3% and 4% sensitivity on cold and chewing stimulus. Post-operative sensitivity shown by RMGI on 7th day decreased considerably to 8% with 6% and 2% sensitivity on cold and masticatory actions. Day 30th showed the least post-operative sensitivity of only 3.3% with 2% and 1.3% on cold and chewing respectively. A meta-study conducted in London, revealed that similar studies on RMGI effectiveness.[7,17] According to which, one study showed excellent pulp response in 7 to 30 days with resin modified glass ionomer restoration. Similarly only 9 teeth showed post-operative sensitivity out of 274 with excellent results in favor of resin modified glass ionomers in the study conducted by van Dijken *et al*. Another study in the same year by Sidhu *et al*. showed no post-operative sensitivity in 36 Resin Modified Glass Ionomer restorations. In the same way, our study has also shown a good response in pediatric patients in this

regard.[18] Juxtaposing the two materials, both have demonstrated decrease in post-operative sensitivity with passing time, which makes both the materials well tolerated by the patients. Group I and II showed no significant difference of post-operative sensitivity comparison on day 1, 7 as well as 30. Similarly, both materials showed a decrease in sensitivity over the passage of time. This brings us to the outcome that both materials have almost similar effects in the pulp health and post-operative sensitivities which subsides with time for both.[18] A dental professional is accountable to notify the patients prior to any treatment about the possibility post-operative sensitivity. Proper diagnosis, accurate treatment planning, understanding of various techniques and knowledge of dental materials along with their merits, demerits and indications are utmost important factors in the success of a desired restorative treatment.

LIMITATIONS OF STUDY

The patients were not checked manually through follow up visits rather they were contacted verbally for their symptoms. However, the merits of the study include good sample size and the elimination of operator related error since a single clinician, well versed with operative techniques, performed all the procedures.

CONCLUSION

Within the limitations of the study, it is concluded that both of the materials are acceptable for pediatric restorations. RMGI as well as composites showed no major difference in post-operative sensitivity in the primary teeth which makes them equally effective restorative materials in this Group of patients. It should be noted that the post-operative sensitivity reduces with time in both the restorative materials being used in the study.

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Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

MA & SMHS: Conception, study design, drafting the manuscript, approval of the final version to be published.

LA & VF: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

HHK: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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