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

International Journal of Current Research
Vol. 10, Issue, 04, pp.67798-67802, April, 2018

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

COMPARATIVE EVALUATION OF MICROLEAKAGE OF RESIN MODIFIED GLASS IONOMER, GLASS IONOMER CEMENT TYPE II AND TYPE IX: AN IN-VITRO STUDY

Dr. Shweta Chaudhary, *Dr. Sumedha Baghel, Dr. Chetan Bhat, Dr. Rahul Lodaya, Dr. Preetam Shah and Dr. Smita Patil

Bharati Vidyapeeth Deemed University Dental College and Hospital, Pune, India

ARTICLE INFO

Article History:
Received 19th January, 2018
Received in revised form
26th February, 2018
Accepted 06th March, 2018
Published online 30th April, 2018

Key words:
Resin modified glass ionomer cement,
Microleakage,
Stereomicroscope.

ABSTRACT

Introduction: Glass ionomer cements (GIC) are commonly used in restorative and pediatric dentistry for their long term fluoride release and ease of use. However, disadvantages related to glass ionomers; such as lack of strength, prolonged setting time, moisture sensitivity, dehydration, and poor esthetics have been reported. Due to these disadvantages of the conventional GIC, hybrid versions of the material were introduced. Among these, resin modified glass ionomers (RMGIs) that can be photocured is said to have better physical characteristics.

Aim: the aim of this in vitro study is to evaluate the microleakage of nano filled resin modified glass ionomer in comparison to high viscosity glass ionomer cement.

Materials and Methods: Extracted primary teeth will be collected from the patients who are advised extraction. A class II cavity was prepared in each tooth which were divided into two groups randomly. The specimen in each group were restored using the allotted restorative material and thermocycled. Microleakage was evaluated using basic fuschin dye and stereomicroscope.

Conclusion: Glass ionomer cements (GIC) are commonly used in restorative and pediatric dentistry for their long term fluoride release and ease of use. However, disadvantages such as microleakage, have been reported. Due to these disadvantages of the conventional GIC, hybrid versions of the material were introduced. Among these, resin modified glass ionomers (RMGIs) that can be photocured is said to have better physical characteristics.

Citation: Dr. Shweta Chaudhary, Dr. Sumedha Baghel, Dr. Chetan Bhat, Dr. Rahul Lodaya, Dr. Preetam Shah and Dr. Smita Patil, 2018. "Comparative evaluation of microleakage of resin modified glass ionomer, glass ionomer cement type ii and type ix: an in-vitro study", *International Journal of Current Research*, 10, (04), 67798-67802.

INTRODUCTION

The success of a dental restoration is reliant on several factors. These may generally be related either to the dentist, to the patient and/or to the type of restorative material (Ghulam and Fadel, 2017). One of the most common causes of replacement of dental fillings is recurrent or secondary caries (Deligeorgi et al., 2001). Mjor (2005) reported that the gingival wall of class II proximal dental restorations is the most common site for secondary caries (Mjor, 2005). Glass ionomer cements are commonly used in paediatric dentistry for their ease of use and long term fluoride release. Although, accepted as best dentin replacement material, they have many disadvantages including micro leakage. Therefore, many modifications have been done to improve their physical and/or chemical properties. Introduction of resin modified glass ionomers were one such step towards improvement.

Corresponding author: **Dr. Sumedha Baghel,**
Bharati Vidyapeeth Deemed University Dental College and Hospital, Pune, India.

Besides the advantages of glass ionomers, their early resistance to moisture contamination and ease of placement makes them more resistant to microleakage and user friendly. Hence, in the following study, comparison of microleakage, in class II cavities, of conventional glass ionomer cements (type II and type IX) were done with resin modified glass ionomer cement. Materials and Method: 30 extracted primary maxillary and mandibular molar teeth were collected and stored in saline for the study. Disinfection of teeth was done by placing it in 1% of sodium hypochlorite solution for 15 minutes. A cavity measuring 3mm*6mm*2mm was prepared on the mesio- and/or disto-occlusal surface of the teeth. The samples (n=30) were divided into three groups for respective restorative materials. group A: high viscosity Glass ionomer cement type II, group B: resin modified glass ionomer cement and group C: Glass ionomer cement type IX. Before material placement, the preparations were cleaned with a rubber cup and a slurry of pumice powder. The allotted restorative materials were placed following manufacturers' instructions. The restored teeth were stored in distilled water at 37°C for 24 h.

The specimens were then thermocycled at 5°C and 55°C for 1000 cycles with a dwell time of 30 s at each temperature and 10 s transfer time between baths. After thermocycling, they were placed in 2% basic fuschin dye for 24 hours, then removed from the dye, rinsed in tap water for 30s and dried. Subsequently, teeth were embedded in polyester and sectioned longitudinally in a buccolingual direction through the centre of both cavities. The sectioned samples were viewed under stereomicroscope for microleakage analysis.

RESULTS

The samples showed the following results

	GIC TYPE II	GIC TYPE IX	VITREMER
Sample 1	4	1	2
Sample 2	4	2	2
Sample 3	4	1	3
Sample 4	4	2	2
Sample 5	3	4	3
Sample 6	3	4	2
Sample 7	4	4	2
Sample 8	4	4	3
Sample 9	3	2	2
Sample 10	3	1	2
Sample 11	4	2	2
Sample 12	4	1	3
Sample 13	4	1	2
Sample 14	3	2	2
Sample 15	3	1	3
Sample 16	3	2	2
Sample 17	3	4	2
Sample 18	4	4	3
Sample 19	4	4	2
Sample 20	4	4	3
Sample 21	4	2	2
Sample 22	3	1	2
Sample 23	3	2	2
Sample 24	3	1	3
Sample 25	3	1	2
Sample 26	3	2	3
Sample 27	4	1	2
Sample 28	4	2	2
Sample 29	4	4	2
Sample 30	4	4	3

	GIC TYPE II	GIC TYPE IX	VITREMER
Score 0	0%	0%	0%
Score 1	0%	33.33%	0%
Score 2	0%	33.33%	66.66%
Score 3	43.33%	0%	33.33%
Score 4	56.66%	33.33%	0%

Score 0: No dye penetration
Score 1: Upto 1/3rd cavity depth
Score 2: 1/3rd to 2/3rd cavity depth
Score 3: >2/3rd cavity depth
Score 4: Involving the axial wall.

The scores were tabulated, interpreted and the resultant findings were statistically evaluated by Mann–Whitney test.
The statistical analysis of the scores of microleakage revealed that there was no significant difference between the microleakage scores of GIC type II, type IX and Vitremer as the *P* value was 0.495 which is more than 0.05

DISCUSSION

The longevity of a restoration depends on good marginal sealing, thereby reducing marginal leakage, which is the precursor of the secondary caries, marginal deterioration, postoperative sensitivity and pulpal pathology (Pavuluri et al., 2014).

When the materials were compared, differences were clearly shown. GIC type II showed maximum microleakage involving the axial wall (56.66%), whereas Vitremer showed maximum microleakage involving 1/3rd to 2/3rd of the dentinal wall. GIC type IX showed equal number of samples with microleakage involving the upto 1/3rd of cavity, 1/3rd to 2/3rd of dentinal wall and microleakage involving the axial wall. By comparision, Vitremer showed least amount of microleakage, but the results were statistically insignificant. Conventional Glass Ionomer Cement (GC Fugi type II and GC Fugi type IX Extraa Posterior) are the materials most commonly used for restoration of proximal carious lesions in pediatric clinical practice and therefore were used to compare newer Resin Modified Glass Ionomer Cement (Vitremer) for microleakage in this study. Although many studies have been done to evaluate the microleakage of Vitremer in comparision to other restorative materials, data on microleakage in class II cavities of primary dentition, is sparse

Figure 1. Extracted primary maxillary and mandibular teeth

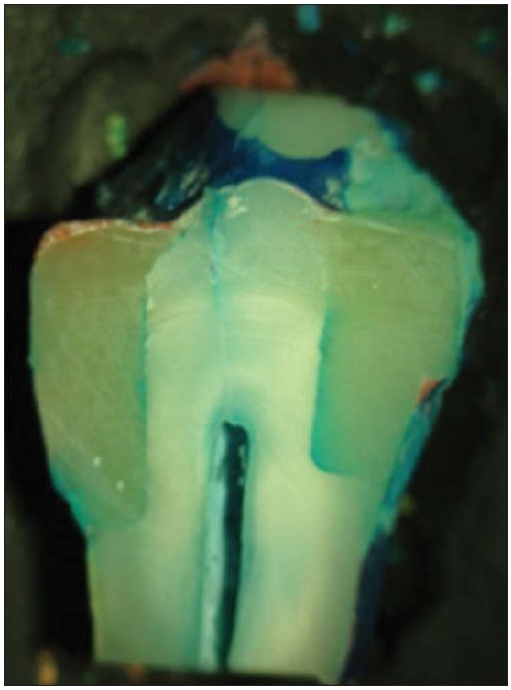

Figure 2: Extracted tooth with proximal cavity restored with allotted restorative material

Figure 3. GIC Type II

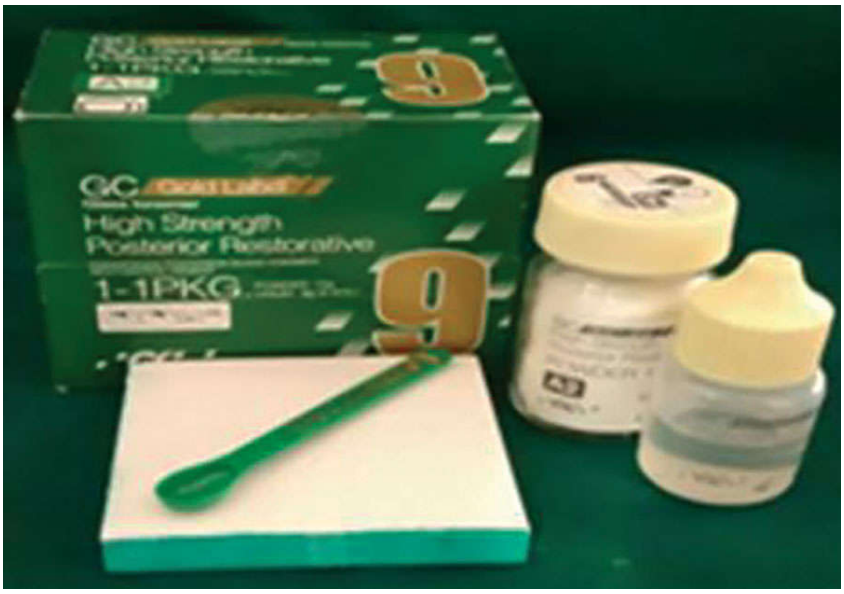

Figure 4. GIC Type IX

Figure 5.Vitremer

Figure 6. Restored samples dipped in Basic Fuchsin dye

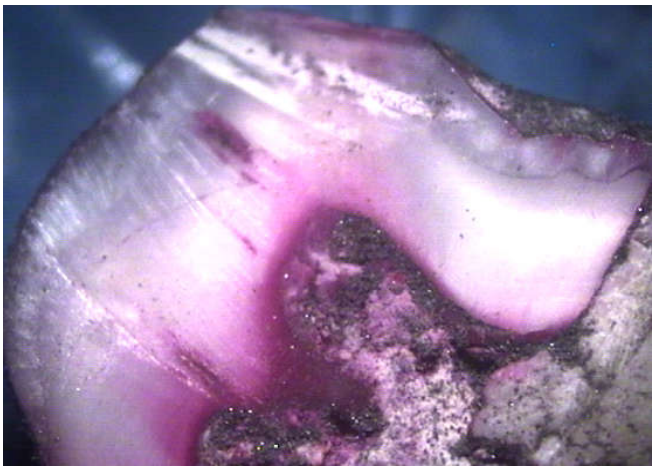

Figure 7. Microleakage under stereomicroscope for GIC Type II

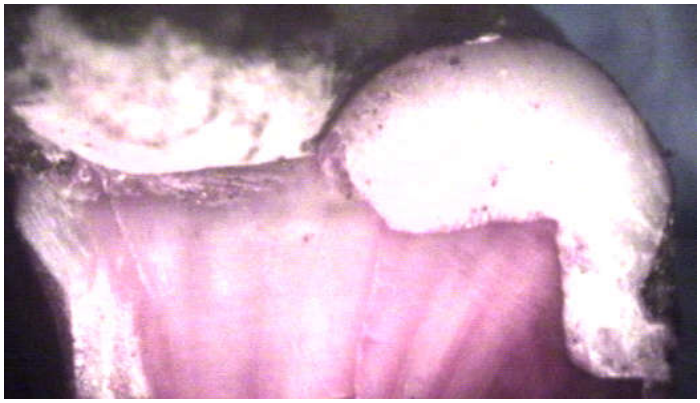

Figure 8. Microleakage under stereomicroscope for GIC Type IX

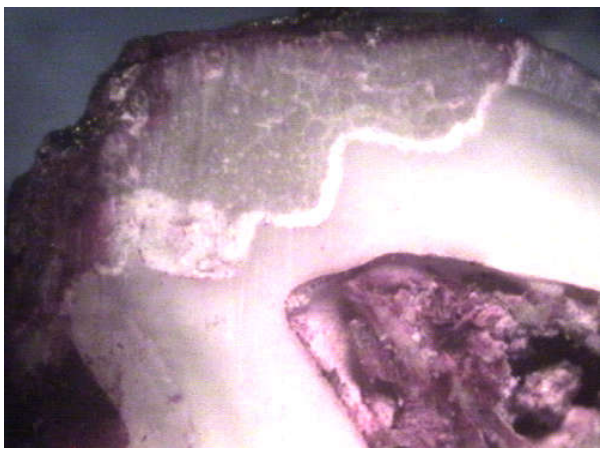

Figure 9. Microleakage under stereomicroscope for Vitremer

The presence of microencapsulated potassium persulfate and ascorbic acid in the powder of Vitremer compound may be attributed to the better chemo-mechanical adhesion to the tooth. with the basic findings of Hallet *et al.* 1989, Hallet and Garcia-Godoy 1993, Erdilek *et al*. 1997, Wilder *et al*. 2000 and indicate that cavities filled with resin modified glass ionomers had significantly less leakage than similar cavities filled with conventional glass ionomer cements. It has been shown that composite resins and resin-modified glass ionomer cements provide a better seal than glass ionomer cements. Some previous investigations did not find similar results (Dougla and Fundingsland, 1992). A study done by Shruthi *et al.* (1992) comparing the microleakage of GIC type II, GIC type IX, Compoglass F and Vitremer was done, in which Vitremer showed least amount of microleakage. This data was also supported by Toledano *et al*. (1999). Castro and Feigal (2002), Zyskind *et al*. (1991) Gladys *et al*. (1998) Rodrigues *et al*. (1999). There were some limitations in the conduction of this study:

- Being an *in vitro* study, the simulation of oral environment was not exact.
- Microleakage from the margins of the restoration was evaluated using a single parameter, that is, by dye penetration method only.

Conclusion

In spite of these limitations, the study has given an idea on the amount of microleakage of conventional and resin modified GIC in primary teeth and also concludes that there was some amount of microleakage present in all the groups. Hence, development of a new material or further modifications in existing materials need to be done so as to provide a material with the advantages of existing materials without their shortcomings.

REFERENCES

Castro, A. and Feigal, RE. 2002. Microleakage of a new improved glass ionomer restorative material in primary and permanent teeth. *Pediatr Dent.,* 24:23-8.

Deligeorgi, V., I. A. Mjor and N. H. Wilson 2001. "An overview of reasons for the placement and replacement of restorations." *Prim Dent Care,* 8(1): 5-11.

Douglas, WH. and Fundingsland, JW. 1992. Microleakage of three generically different fluoride releasing liner/bases. *J Dent,* 20:365-369.

Erdilek, N., Ozata, F. and Septcioglu, F. 1997.Microleakage of glass ionomer cement, composite resin and glass ionomer resin cement. *J Clin Pediatr Dent.,* 21(4):311-314.

Gladys, S., Van Meerbeek, B., Lambrechts, P. and Vanherle, G. 1998.Marginal adaptation and retention of a glass-ionomer, resin-modified glass-ionomers and a polyacid-modified resin composite in cervical Class-V lesions. *Dent Mater.,* 14:294-306.

Hallet, KB. and Garcia-Godoy, F. 1989. Microleakage of resin modified glass ionomer cement restorations: an in vitro study. *Dent Mater,* 5(6):392-398, 1989.

Hallet, KB. and Garcia-Godoy, F. 1993. Microleakage of resin modified glass ionomer cement restorations: an in vitro study. *Dent Mater* 9:306-311.

Mjor, I. A. 2005. "Clinical diagnosis of recurrent caries." *J Am Dent Assoc.,* 136(10): 1426-1433)

O.A. Ghulam, H.T. 2017. Fadel, can clusters based on caries experience and medical status explain the distribution of overhanging dental restorations and recurrent caries? A cross-sectional study in Madinah - Saudi Arabia, Saudi *Journal of Biological Sciences,* (http://dx.doi.org/10.1016 /j.sjbs.2017.02.001.

Pavuluri, C., Nuvvula, S., Kamatham, RL. 2014. Nirmala SVSG. Comparative Evaluation of Microleakage in Conventional and RMGIC Restorations following Conventional and Chemomechanical Caries Removal: An in vitro Study. *Int J Clin Pediatr Dent.,* 7(3):172-175.)

Rodrigues, JA., De Magalhães, CS., Serra MC. and Rodrigues Júnior, AL. 1999. *In vitro* microleakage of glass-ionomer composite resin hybrid materials. *Oper Dent.,* 24:89-95.

Shruthi, A.S., Nagaveni, N.B., Poornima, P., Selvamani, M., Madhushankari, G.S. and Subba Reddy, V. V. 2015. Comparative evaluation of microleakage of conventional and modifications of glass ionomer cement in primary teeth: An *in vitro* study. *J Indian SocPedodPrev Dent*., 33:279-84

Toledano, M., Osorio, E., Osorio, R. and García-Godoy, F. 1999. Microleakage of Class V resin-modified glass ionomer and compomer restorations. *J Prosthet Dent*., 81:610-5.

Wilder, AD Jr., Swift, EJ Jr., May KN Jr., Thompson, JY. Mc and Dougal RA. 2000. Effect of finishing technique on the microleakage and surface texture of resin modified glass ionomer restorative materials. *J Dent*., 28(5):367-373.

Zyskind, D., Frenkel, A., Fuks, A. and Hirschfeld, Z. 1991. Marginal leakage around V-shaped cavities restored with glass-ionomer cements: An *in vitro* study. *Quintessence Int.,* 22:41-5.

****