Research Article

JRAD Journal of Research and Advancement in Dentistry

J Res Adv Dent 2021;11:2s:78-81.

Comparison of Microleakage of Flowable Composite as A Liner: An In Vitro Study

Sonal[1*] Naveen Kumar[2] Soni Kumari[3] Aastha[4] Rohit Siddhartha[5]

[1]Senior Lecturer, Department of Conservative Dentistry and Endodontics, Dr BR Ambedkar Institute of Dental Science and Hospital, Patna, Bihar, India.
[2]Tutor, Department of Community Dentistry, Patna Dental College and Hospital, Patna, Bihar, India.
[3]Senior Lecturer, Department of Orthodontics, Hazaribagh College of Dental Sciences and Hospital, Hazaribagh, Jharkhand, India.
[4]BDS, Private Consultant, Patna, Bihar, India.
[5]Senior Lecturer, Department of Conservative Dentistry and Endodontics, Awadh Dental College and Hospital, Jamshedpur, Jharkhand, India.

ABSTRACT

Background: Composites require more manual dexterity and time to place when compared to the amalgam restoration. Due to this, recently composites have been manufactured by densely loaded fillers with hybrid composites. These composites have an increased wear resistance and increased stiffness.

Materials & Methods: Forty tooth were taken and two cavities were prepared on mesial and distal surfaces. One cavity was restored with composite without liner and the other was restored with composite liner. Both were kept in dye and later it was observed under microscope for microleakage.

Results: In group A and group B samples, Cavities restored only with packable composite had significantly higher micro leakage than cavities lined with fluid composite. GROUP A [P=0.006; P=O.O24], GROUP B [P=0.000; P=O.009].

Conclusion: Microleakage was more prominent in the restorations which were not lined with flowable composites when compared with the restorations which were lined by the liners..

Keywords: Composite resin, liner, microleakage.

INTRODUCTION

There is lot of increase in demands for esthetic restoration. Public concern is more related to mercury use in dental amalgam. More wear resistance and adhesion techniques have resulted in increased interest in composite resin.[1] The composite resins are never a substitute for amalgam restoration.[2] Composites require more manual dexterity and time to place when compared to the amalgam restoration.[3] Due to this, recently composites have been manufactured by densely loaded fillers with hybrid composites.[4] These composites have an increased wear resistance and increased stiffness.[5] Despite so many advantages of these packable composites, the ability of these stiffer materials to adequately adapt to internal areas and cavosurface margins becomes technique sensitive.[6]

To compensate this shortcoming and intermediate liner layer has been suggested beneath the packable composite with a flowable composite.[7] These flowable resins are less viscous, increased wettability, and increased elasticity.[8] Being less viscous it can be well adapted to cavosurface margins. It also acts as intermediate flexible layer that helps in bearing stresses during shrinkage due

Received: Nov. 16, 2020: **Accepted**: Jan. 19, 2021
***Correspondence Dr. Sonal.**
Department of Conservative Dentistry and Endodontics, Dr BR Ambedkar Institute of Dental Science and Hospital, Patna, Bihar, India.
Email: Not Disclosed

pISSN 2278-0076
eISSN 2321-9270

to curing.[9] This special property and syringe delivery makes them ideal for use as a liner. The aim of this study was to investigate the check the feasibility of flowable composite as an intermediate liner.

MATERIALS AND METHODS

This study was conducted in Department of conservative and endodontics of our institute after getting the ethical clearance of internal review board committee. Forty pre extracted permanent mandibular molar teeth which were free of cracks, caries and fractures were selected for the in vitro study. All the tooth were stored in 0.2% sodium azide at room temperature. Post this tooth were cleaned using distilled water and further it was stored in the same at room temperature.

Two class II preparation was prepared on mesial and distal surfaces of each teeth. The bur used diamond point bur with a high speed airrotar hand piece. It was made sure that the adequate cooling was maintained using adequate water supply. It was made sure that a minimum of 1 mm tooth structure remained between the tooth cavity preparation. The cervical were placed at least 1.5 mm apical to CEJ. Forty teeth with two preparations per tooth were assigned into two groups by using coin toss methods.

Tooth were etched and bonding agent were applied and light cured. A stainless-steel matrix (Tofflemire) was then adapted to the cavity before incremental insertion and light curing of the restorative material. Before the restoration a liner was applied randomly. The curing was done as per manufacturers instruction. One side of the cavity was restored with Solitaire (KULZUR) and the other side was lined with Charisma flow (KULZER) and then restored with Solitaire (Group A).

Group B restoration procedure was same as group A. One side was restored with Filtek p60 (3M); the other side was lined with Filtek flow (3M) and then restored with Filtek p60. The bonding agent used was Scothbond (3M). All the specimen were then thermocycled. After thermocycling the apex of each tooth was sealed with epoxy cement. Specimens were placed in a solution of 0.5% basic fuschin dye for 24 hours.

Entrenched samples were sectioned longitudinally over their centers mesial to distal using a hard tissue microtome to harvest multiple segments. Dye infiltration was measured at the cervical and occlusal margins of all restorations. The extent of microleakage was determined visually under a stereomicroscope at 40x.

Descriptive statistics was applied to asses mean and standard deviation of microleakage, 'unpaired t test' was used to compare microleakage.

RESULTS

Table 1: Demonstrates micro leakage in cavities, one which is lined with flowable composite and one which is not lined with flowable composite.

		Group	N	Mean	SD	t value	P value
Group A	Cervical _ K	P+F	20	1.67	.606	-6.812	.000
		P	20	3.10	.701		
	Occlusal _ K	P+F	20	1.45	.813	-2.198	.021
		P	20	1.4	.623		
Group B	Cervical_ 3M	P+F	20	1.91	.834	-4.912	.000
		P	20	3.45	.845		
	Occlusal _ 3M	P+F	20	1.09	.963	-2.109	.007
		P	20	1.67	.913		

In group A and group B samples, Cavities restored only with packable composite had significantly higher micro leakage than cavities lined with fluid composite. GROUP A [P=0.006; P=O.O24], GROUP B [P=0.000; P=O.O09]

DISCUSSION

There was less microleakage in the restoration lined by flowable composites in both the groups.[10] This can be related to thickness of the flowable liner that reduces the problem of oxygen inhibition. This intern helps to maintain a strong, durable and airtight bond to the dentin.[11] Low modulus of elasticity and non-stickiness helps additionally in doing so. Increased wettability and fluid injectability may be useful in absorbing stresses and decreasing microleakage caused by the shrinkage.[12] The use of flowable composite as a liner tends to reduce the effect of C-factor.[13] High amount of microleakage at occlusal and cervical areas of restoration may be due to these materials that may not adapt to the internal areas and cavosurface margins, due to its stiffness.[8,14]

There was more microleakage at occlusal and cervical margin in both the groups. This may be due to bond strength which was usually higher than the bond strength to dentin.[15] Dentin has less favourable bonding substrate when compared to enamel.[16]

CONCLUSION

This study can be concluded as:

1. Microleakage was more prominent in the restorations which were not lined with flowable composites when compared with the restorations which were lined by the liners.

2. Occlusal restorations showed less microleakage when compared with the cervical margins.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

REFERENCES

1. Leevailoj C, Cochran MA, Matis BA, Moore BK, Platt JA. Microleakage of posterior packable resin composites with and without flowable liners. *Oper Dent*. 2001;26(3):302-307.

2. Composite Resin Versus Amalgam for Dental Restorations. In: *CADTH Report / Project in Briefs*. Canadian Agency for Drugs and Technologies in Health; 2011. Accessed February 10, 2021. http://www.ncbi.nlm.nih.gov/books/NBK535155/

3. Dilley DC, Vann WF, Oldenburg TR, Crisp RM. Time required for placement of composite versus amalgam restorations. *ASDC J Dent Child*. 1990;57(3):177-183.

4. Shakuntala O, Raghavendra G, Samir Kumar A. Effect of Filler Loading on Mechanical and Tribological Properties of Wood Apple Shell Reinforced Epoxy Composite. *Adv Mater Sci Eng*. 2014;2014:1-9. doi:10.1155/2014/538651

5. Rajak DK, Pagar DD, Menezes PL, Linul E. Fiber-Reinforced Polymer Composites: Manufacturing, Properties, and Applications. *Polymers*. 2019;11(10). doi:10.3390/polym11101667

6. Majety KK, Pujar M. In vitro evaluation of microleakage of class II packable composite resin restorations using flowable composite and resin modified glass ionomers as intermediate layers. *J Conserv Dent*. 2011;14(4):414. doi:10.4103/0972-0707.87215

7. Rizk HM, Al-Ruthea M, Habibullah MA. The effect of three lining materials on microleakage of packable composite resin restorations in young premolars with cavity margins located on enamel and dentin/cementum - An In vitro study. *Int J Health Sci*. 2018;12(6):8-17.

8. Baroudi K, Mahmoud S. Improving Composite Resin Performance Through Decreasing its Viscosity by Different Methods. *Open Dent J*. 2015;9:235-242. doi:10.2174/1874210601509010235

9. Pocovi-Gerardino G, Correa-Rodríguez M, Rubio J-LC, et al. The Relationships of High-Sensitivity C-Reactive Protein and Homocysteine Levels With Disease Activity, Damage Accrual, and Cardiovascular Risk in Systemic Lupus Erythematosus. *Biol Res Nurs*. Published online November 25, 2019:1099800419889192. doi:10.1177/1099800419889192

10. Korkmaz Y, Ozel E, Attar N. Effect of flowable composite lining on microleakage and internal voids in Class II composite restorations. *J Adhes Dent*. 2007;9(2):189-194.

11. Cho E, Chikawa H, Kishikawa R, et al. Influence of elasticity on gap formation in a lining technique with flowable composite. *Dent Mater J*. 2006;25(3):538-544. doi:10.4012/dmj.25.538

12. Pilatti GL, André dos Santos F, Bianchi A, Cavassim R, Tozetto CW. The use of celecoxib and dexamethasone for the prevention and control of postoperative pain after periodontal surgery. *J Periodontol*. 2006;77(11):1809-1814. doi:10.1902/jop.2006.060128

13. Belli S, Dönmez N, Eskitaşcioğlu G. The effect of c-factor and flowable resin or fiber use at the interface on microtensile bond strength to dentin. *J Adhes Dent*. 2006;8(4):247-253.

14. M R, Sajjan GS, B N K, Mittal N. Effect of different placement techniques on marginal microleakage of deep class-II cavities restored with two composite

resin formulations. *J Conserv Dent JCD*. 2010;13(1):9-15. doi:10.4103/0972-0707.62633

15. Javidi M, Zarei M, Naghavi N, Mortazavi M, Nejat AH. Zinc oxide nano-particles as sealer in endodontics and its sealing ability. *Contemp Clin Dent*. 2014;5(1):20-24. doi:10.4103/0976-237X.128656

16. Bhandary S, Hegde M. An evaluation and comparison of shear bond strength of composite resin to dentin, using newer dentin bonding agents. *J Conserv Dent*. 2008;11(2):71. doi:10.4103/0972-0707.44054