International Journal of Research in Health and Allied Sciences
Journal home page: www.ijrhas.com
Official Publication of "Society for Scientific Research and Studies" [Regd.]
ISSN: 2455-7803

ORIGINAL RESEARCH

Analysis of microleakage in composite inlays by using two different luting cements: a comparative study

Ritika Yadav[1], Keerthana G[2]

[1]Post graduate student 3rd year, [2]Post graduate student 2nd year, Department of Conservative Dentistry and Endodontics, Post Graduate Institute of Dental Sciences, Rohtak, India

ABSTRACT:
Background: The present study was undertaken for analyzing microleakage in composite inlays by using two different luting cements. **Materials & methods:** A total of 20 freshly extracted maxillary first premolars were included in the present study. Randomization was done and all the specimens were divided into two study groups with 10 specimens in each group as follows: Group A: Multilink N was used as luting agent, and Group B: Multilink speed was used as luting agent. The sections were mounted on slides and the degree of dye penetration was recorded under stereomicroscope. Microleakage was grade on scoring scale of 1 to 4 with 1 indicating no microleakage and 4 indicating microleakage into dentinal tubule towards pulp. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. **Results:** Mean microleakage among specimens of group A and group B was found to be 9.89 and 8.64 respectively. While comparing the mean microleakage among specimens of group A and group B, non-significant results were obtained. **Conclusion:** Both Multilink N and multilink speed were equally efficacious in presenting microleakage of composite inlay.
Key words: Luting agent, Inlay, Composite

Received: 8 December, 2019 Revised: 19 December, 2019 Accepted: 26 December, 2019

Corresponding author: Dr. Ritika Yadav, Post graduate student 3rd year, Department of Conservative Dentistry and Endodontics, Post Graduate Institute of Dental Sciences, Rohtak, India

This article may be cited as: Yadav R, Keerthana G. Analysis of microleakage in composite inlays by using two different luting cements: a comparative study. Int J Res Health Allied Sci 2020; 6(1):106-108.

INTRODUCTION

The World Health Organization (WHO) estimates the prevalence of dental caries is over 90% among adults worldwide. When the loss of tooth substance due to decay is minor, the dentist fills the tooth cavity. With substantial tooth substance loss, the dentist often treats the tooth with a crown, which presents the problem of further destroying the tooth. Large amalgam or build-up amalgam restorations are also used in such cases in many countries; however, amalgam is being abandoned for environmental reasons.[1- 3] An intermediate technique consists of manufacturing an inlay or onlay for the tooth and this type of restoration has become common because it is a minimally invasive solution. Inlays and onlays can be made of metal alloy, ceramic or composite materials; however, patients tend to refuse metallic restorations for esthetic and financial reasons, and thus dentists generally have to choose between composite and ceramic materials. Luting cements are used to seal gaps and preserve the tooth from microbial invasion. Microleakage is indicated by post-treatment hypersensitivity, chronic tooth hypersensitivity, and marginal discoloration around the restoration.[4- 6] Hence; the present study was undertaken for analyzing microleakage in composite inlays by using two different luting cements.

MATERIALS AND METHODS

The present study was conducted for assessing microleakage in composite inlays by using two different luting cements. A total of 20 freshly extracted maxillary first premolars were included in the present study. All the specimens were stored in normal saline till further use. All the specimens were thoroughly cleansed prior to use. Randomization was done and all the specimens were divided into two study groups with 10 specimens in each group as follows:
Group A: Multilink N was used as luting agent
Group B: Multilink speed was used as luting agent
Preparation of standard class II inlay box cavities were made in all the specimens using high speed hand piece. Placement of composite was done in incremental pattern and cured initially (40 sec) using halogen light curing

unit. Then, the composite inlays were removed from the teeth and post cured in polymat light curing unit. Bonding surface of the inlays was sandblasted using intra oral microetcher device. Sandblasted surfaces were irrigated with water and air dried. The luting cements were mixed and applied as per the manufacturer's instructions. The inlay was seated into the cavity and excess material was removed with scaler. Two layers of nail varnish were applied to all the tooth surfaces except for about 1mm around the restoration margin. All the samples were then placed in 0.5% basic fuchsin for 24 hours. After dye penetration and irrigation of the teeth, samples were sectioned mesio-distally in vertical plan using a diamond disc in slow speed with water spray. The sections were mounted on slides and the degree of dye penetration was recorded under stereomicroscope. Microleakage was grade on scoring scale of 1 to 4 with 1 indicating no microleakage and 4 indicating microleakage into dentinal tubule towards pulp. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software.

RESULTS

In the present study, 20 freshly extracted maxillary first premolars were included and were divided into two study groups with 10 specimens in each group as follows: Group A: Multilink N was used as luting agent, and Group B: Multilink speed was used as luting agent. Mean microleakage among specimens of group A and group B was found to be 9.89 and 8.64 respectively. While comparing the mean microleakage among specimens of group A and group B, non-significant results were obtained.

Table 1: Comparison of microleakage

Microleakage	Group A	Group B
Mean	9.89	8.64
SD	1.23	1.11
p- value	0.44	

DISCUSSION

Advances in restorative dentistry and increases in patient expectations regarding aesthetics have led to demands for non-metallic, tooth-colored restorations in the posterior region. Indirect composite resin systems represent an alternative to overcome some deficiencies of direct composite restorations. The composition of indirect composite resin systems is similar to that of direct systems, differing by the use of various methods of additional polymerization, which cause a higher radical conversion. These additional polymerization procedures can involve photo-activation, heat, pressure, and a nitrogen atmosphere. Post curing at high temperature results in a higher stress relaxation and degree of conversion compared to the directly placed light-cured composite restoration. Moreover, polymerization shrinkage takes place outside the mouth, thus limiting the shrinkage to that of the thin luting cement layer. In comparison to direct composite restorations, indirect adhesive restorations are believed to exhibit better proximal contact, occlusal morphology and marginal compatibility.[7-10] Hence; the present study was undertaken for analyzing microleakage in composite inlays by using two different luting cements.

In the present study, 20 freshly extracted maxillary first premolars were included and were divided into two study groups with 10 specimens in each group as follows: Group A: Multilink N was used as luting agent, and Group B: Multilink speed was used as luting agent. Mean microleakage among specimens of group A and group B was found to be 9.89 and 8.64 respectively. A C Shortall et al investigated the effect of surface treatments on the bond strength between two resin' composite inlay materials and their luting materials. A notched disc specimen design was used to evaluate the torque to fracture: test specimens consisting of two half notched disc specimens bonded together, controls consisting of complete resin composite material specimens. Both surface treatment and bond resin application had a significant influence on interfacial bond strength--the torque required to initiate failure being expressed as a percentage of the value required to fracture the control specimens. The results allowed conclusions to be drawn regarding the attainment of optimal bonding between the resin composite inlays and luting materials investigated.[10]

In the present study, while comparing the mean microleakage among specimens of group A and group B, non-significant results were obtained. Barabanti N et al evaluated posterior indirect composite resin restoration ten years after placement luted with two different procedures. In 23 patients 22 inlays/onlays (Group A) were luted using a dual-cured resin composite cement and 26 inlays/onlays (Group B) were luted using a light cured resin composite for a total of 48 Class I and Class II indirect composite resin inlays and onlays. The restorations were evaluated at 2 time points: 1) one week after placement (baseline evaluation) and 2) ten years after placement using the modified USPHS criteria. Numerical but not statistically significant differences were noted on any of the recorded clinical parameters ($p>0.05$) between the inlay/onlays of Group A and Group B. 91% and 94 % of Group A and B respectively were rated as clinically acceptable in all the evaluated criteria ten years after clinical function. The results showed after ten years of function a comparable clinical performance of indirect composite resin inlays/onlays placed with a light cure or dual cure luting procedures.[11] M Irie et al investigated the effect of thermocycling on the marginal gap formation of composite inlays using three types of luting cements (Compolute, PermaCem, Fuji Plus, Panavia 21: as a control) and on mechanical properties of four luting cements. The maximum marginal gap in the dentin cavity of each of ten resin inlay specimens in each group, was measured by a microscope before and after 10,000 thermocycles. Compolute and Panavia 21 showed marginal gaps of approximately 10 microm before thermocycling. In contrast, the gap widths after thermocycling was significantly wider. Although the gap widths of PermaCem and Fuji Plus were approximately 60-110 microm prior to thermocycling, they were

significantly smaller in width after thermocycling. Statistical differences in the shear bond strength to dentin were not observed before or after thermocycling for all materials. The flexural strength and modulus were significantly increased after thermocycling compared with three products and with all four products, respectively. The mechanical properties of all four luting cements were closely related to their marginal gap formations and these mechanical factors have important roles in determining their marginal gap formations.[12]

CONCLUSION

From the above results, the authors concluded that both Multilink N and multilink speed were equally efficacious in presenting microleakage of composite inlay. However; further studies are recommended.

REFERENCES

1. Shahriari S, Faramarzi F, Alikhani MY, Farhadian M, Hendi SS. Apical Sealing Ability of Mineral Trioxide Aggregate, Intermediate Restorative Material and Calcium Enriched Mixture Cement: A Bacterial Leakage Study. Iran Endod J. 2016;11(4):336-340.
2. St John KR. Biocompatibility of dental materials. Dent Clin North Am. 2007;51:747–760.
3. Wataha JC, Rueggeberg FA, Lapp CA, Lewis JB, Lockwood PE, Ergle JW, Mettenburg DJ. In vitro cytotoxicity of resin-containing restorative materials after aging in artificial saliva. Clin Oral Investig. 1999;3:144–149.
4. Bakopoulou AA, Triviai IN, Tsiftsoglou AS, Garefis PD. In vitro assessment of cytotoxicity of resin-based dental restorative materials on WEHI 13 var fibroblasts. Int J Prosthodont. 2006;19:13–16.
5. Rosenstiel SF, Land MF, Crispin BJ. Dental luting agents: A review of the current literature. J Prosthet Dent. 1998; 80(3): 280–301.
6. Mjor IA, Moorhead JE, Dahl JE. Reasons for replacement of restorations in permanent teeth in general dental practice. Int Dent J. 2000;50(6):361–6.
7. Manhart J, Scheibenbogen-Fuchsbrunner A, Chen HY, Hickel R. A 2-year clinical study of composite and ceramic inlays. Clin Oral Investig. 2000;4:192–198.
8. Manhart J, Chen HY, Neuerer P, Scheibenbogen-Fuchsbrunner A, Hickel R. Three-year clinical evaluation of composite and ceramic inlays. Am J Dent. 2001;14:95–99
9. Jain A, Ponnappa KC, Yadav P, et al. Comparison of the Root End Sealing Ability of Four Different Retrograde Filling Materials in Teeth with Root Apices Resected at Different Angles - An Invitro Study. J Clin Diagn Res. 2016;10(1):ZC14-ZC17.
10. A C Shortall 1, R L Baylis, H J Wilson. Composite inlay/luting resin bond strength--surface treatment effects. J Dent. Jan-Mar 1996;24(1-2):129-35. doi: 10.1016/0300-5712(95)00054-2.
11. Barabanti N, Preti A, Vano M, Derchi G, Mangani F, Cerutti A. Indirect composite restorations luted with two different procedures: A ten years follow up clinical trial. J Clin Exp Dent. 2015;7(1):e54-e59. Published 2015 Feb 1. doi:10.4317/jced.51604
12. M Irie 1, K Suzuki. Current luting cements: marginal gap formation of composite inlay and their mechanical properties. Dent Mater. 2001 Jul;17(4):347-53. doi: 10.1016/s0109-5641(00)00093-2.