Effect of Surface Sealant Coating and Beverages on Color Stability of Provisional Restorative Material

Sirithap T* Kanchanavasita W* Nagaviroj N*

Abstract

The study aimed to investigate the effect of surface sealant coating agent on color stability of Bis-acryl composite resin after immersing in different beverages at various times. Ninety-six disc-shaped specimens were prepared from Bis-acryl composite resin (Luxacrown). The specimens were randomly divided into 2 groups: the non-surface sealant coating group (Group1) and the surface sealant coating group (Luxatemp-Glaze and Bond) (Group2). Twelve specimens of each group were assigned for immersion in distilled water (DW), red wine (RW), coffee (CF) and Coca-Cola (CC). All specimens were immersed in the beverages and stored in an incubator. The color change (ΔE) was measured after immersing for 7, 30 and 150 days with a spectrophotometer, according to the CIELAB system. Data were analyzed statistically with mixed-design ANOVA. Group 1 showed more mean color change in red wine and coffee ($p<0.05$). In both groups, the color change of specimens immersed in coffee was significantly lower than that in red wine at each measurement time except day 150 in Group 1. Moreover, the types of beverages affected mean color change of all three immersion times. In conclusion, surface sealant coating, type of beverages and various immersion time affect the color stability of provisional restorative materials.

Keywords: *Bis-acryl composite resin/ Color stability/ Beverage/ Surface sealant coating*

Received: *Feb 14, 2022*
Revised: *Dec 14, 2023*
Accepted: *Jan 03, 2024*

Introduction

A provisional restoration is essential in temporarily treating patients receiving indirect restoration treatment. The optimum requirements of the provisional restorations are composed of three main features: biological, mechanical and esthetic aspects. Esthetically, it should provide the color matching the adjacent teeth throughout the temporary period.[1]

Sometimes, provisional restorations are used for long term treatment, such as evaluating periodontal treatment, orthodontic treatment, dental implant placement, endodontic treatment and oral rehabilitation. Therefore, this extended period may lead to substantial color change.[2]

The color change of the provisional restorations can reduce the satisfaction of patients. From related studies, it can be concluded that the color stability of provisional restorations could be affected by various factors including incomplete polymerization, the composition of the material, water sorption, types of immersion solution, exposure time and surface smoothness.[3-6]

Various techniques, including conventional polishing, have been used to finish provisional materials. Recently, another method has been employed for smoothing the surface of provisional restoration using a surface sealant coating agent after finishing the surface. By minimizing microcavities and pores, marginal seal, water resistance and stain resistance can all be improved.[7, 8] However, the long-term performance of these agents remains uncertain.[9, 10]

Provisional restoration materials are also stained by various foods. The degree of discoloration varies depending on the substance. On the other hand, coffee, tea and red wine were shown to stain more than other food simulating solutions.[11]

There are many availabilities of different provisional restorative materials in the market, including poly methyl methacrylate (PMMA), poly ethyl methacrylate, Bis-GMA resin and Bis-acryl composite resin. Recently, an automix Bis-acryl composite resin for semi-permanent provisional restoration, LuxaCrown (DMG, Hamburg,

* *Department of Prosthodontics, Faculty of Dentistry, Mahidol University, Bangkok.*

Germany), has been introduced to the market. It has been claimed to have impressive durability, excellent flexural strength and fracture toughness, outstanding polishability and optimum versatility. Due to these advantages, this material is well suited as a longterm provisional restoration. However, this material is composed of methacrylate-based matrices, which are hydrophilic, promoting a higher degree of water sorption, resulting in discoloration of materials.[12]

To study the color differences, the Commission Internationale de I'Eclairage has recommended several color difference formulas including the classic CIE L*a*b* system and the new CIEDE2000 system. Generally, CIEDE2000 formula provided superior results compared to CIE L*a*b* formular[13]. However, some previous studies[14] proposed that ΔE from CIEDE2000 and CIE L*a*b can be used interchangeably because both systems were correlated to each other.

The objective of this study was to investigate the effect of surface sealant coating agents on the color stability of LuxaCrown after long periods of immersion in different beverages.

Materials and methods

The ninety-six disk-shaped specimens were prepared from LuxaCrown (Table1), using the metal mold. The metal mold was placed on the glass slab, and the provisional material was mixed according to the manufacturer instruction and filled in the mold. The other glass slab was placed on top of the metallic mold and pressure was applied by finger loading until it set. The specimens were removed from the mold and visually inspected for any defects. The specimens were wet finishing by silicon carbide abrasive papers grit no.800, 1,000 and 1,200, respectively for removing irregularities and smoothening the specimens' surface. Each specimen was fabricated into a size of 15±0.1 mm in diameter and 1±0.1 mm thick. The dimensions of the finished specimen were measured using digital calipers with an accuracy of 0.01 mm. The specimens were randomly divided in two groups: Group 1: the non-surface sealant coating group (n=48) and Group 2: the surface sealant coating group (n=48). For Group 1, the specimens were stored in distilled water in an incubator at 37°C for 24 hours before testing. For Group 2, the Luxatemp-Glaze & Bond (DMG, Hamburg Germany) (Table 2) was applied to the specimen's surface according to the manufacturer instructions. A soft brush was used to apply a thin, even layer in one direction without rebrushing, and air bubbles were carefully avoided. After an exposure time of approximately 20 seconds, the specimens were placed in a Lumamat® 100 light furnace (Ivoclar Vivadent, Schaan, Liechtenstein) for polymerization. After that, the specimens were stored in distilled water in the incubator at 37°C for 24 hours before testing. (Table 1) (Table 2)

Table 1 Provisional restoration material used in this study

Material	Shade	Manufacturer	Composition	Technique	Polymerization method
LuxaCrown	A3	DMG, Hamburg, Germany	Glass filler material in a matrix of multifunctional methacrylates; catalysts, stabilizers, and additives. Free of methyl methacrylate. Filler content: 46 wt.% = 26 vol.%. (0.02 to 1.5 μm)	Paste-Paste Automix	Chemically activated

Table 2 Surface sealant coating agent used in this study

Material	Shade	Manufacturer	Composition	Polymerization method
Luxatemp-Glaze&Bond	-	DMG, Hamburg, Germany	Multifunctional acrylates, methyl methacrylate, catalysts, stabilizers, additive	Light cured

The 360 ml of beverages used in the experiment consisted of 1. distilled water (control group), 2. red wine (Mont Clair, Siam Winery, Samut Sakhon, Thailand), 3. coffee (Nescafe red cup, Nestle, Thailand) prepared in the ratio of 2g of instant coffee and 180 ml of hot water and 4. Coca-Cola (ThaiNamthip, Bangkok, Thailand). All specimens were immersed in beverage and stored in the incubator at 37°C during experiment period. The beverages were changed every other day. Furthermore, the initial pH of all beverages was also measured in this experiment using a pH meter (ORION 3-star, Expotech, USA).

After removing all specimens out of the beverages, each specimen was rinsed in distilled water. Excess water on the surfaces was removed with tissue paper. The color measurement of all specimens was performed before immersing in the beverages and again after 7, 30 and 150 days with a spectrophotometer (Ultrascan XE, Hunter Lab, USA) using the Commission Internationale de I'Eclairage (CIE) L*a*b* system.[15] The measuring characteristics of spectrophotometer were standard illuminant D65 and standard observer 10 degrees. Before each measurement session, the spectrophotometer was calibrated according to the manufacturer's recommendations by using the light trap and white calibrated tile. The specimen was placed at the reflectance port with a magnetic white ceramic backing disk on the face of the spring-load sample clamp to provide a consistent white background. Then, the magnetic white ceramic disk was replaced by the black pad to provide the dark backing.

The total color change (ΔE) was calculated for each specimen in relation to its baseline color using the formula: $\Delta E = [(\Delta L)^2 + (\Delta a)^2 + (\Delta b)^2]^{1/2}$ where ΔE represents the color difference and ΔL, Δa, Δb represents the changes in lightness, changes in red-green coordinate, and changes in yellow-blue coordinate, respectively.

To explore the surface smoothness and porosity of materials of specimens, the additional specimens were prepared using the same procedure of Group 1 and 2 and were examined using scanning electron microscopy (JSM 6610LV, JEO, JAPAN).

Statistical calculations were analyzed using SPSS Statistics Software (SPSS, 23.0, SPSS Inc., Armonk, NY, USA). The mixed-design analysis of variance (at significance level of 0.05) was used to compare the color stability in this study.

Results

The mean color change (ΔE) of provisional restoration materials between the non-surface sealant coating group and the surface sealant coating group after immersing in beverages are shown in Table 3. In distilled water and Coca-Cola, no significant difference was observed in mean color change between Groups 1 and 2 at days 7, 30 and 150 ($p>0.05$). (Table 3)

In Group 1, the pairwise comparison revealed significant differences in color change when exposed to distilled water and red wine, distilled water and coffee, red wine and Coca-Cola, and coffee and Coca-Cola at every immersion period. On the contrary, the mean color change showed no significant difference between distilled water and Coca-Cola. (Table 4) Compared between immersion periods, significant differences in mean color change were observed at days 7, 30 and 150 for red wine and coffee, while no significant difference was observed in all immersion periods for distilled water and Coca-Cola (Table 4) (Figure 1).

In Group 2, the pairwise comparison showed a significant difference in mean color change between distilled water and red wine, distilled water and coffee, red wine and coffee, red wine and Coca-Cola, and coffee and Coca-Cola at day 30 and 150. At day 7, significant differences were observed in mean color change between red wine and other beverages. Compared between immersion periods, significant differences were observed in mean color change at days 7, 30 and 150 for red wine. For coffee, significant differences were observed in mean color change between days 7 and 150. (Table 5) (Figure 2).

Table 3 The mean color change (ΔE), standard deviation (SD) of provisional restoration materials between the non-surface sealant coating group and the surface sealant coating group after immersion in distilled water, red wine, coffee, and Coca-Cola at 7 days, 30 days, and 150 days (n=12)

Beverages	Day	Mean color change (ΔE)± SD	
		Non-surface sealant coating group	Surface sealant coating group
Distilled water	7	2.27 ±0.82^{A}	1.97±1.06^{A}
	30	2.40^{A}±0.79^{A}	2.06±0.68^{A}
	150	2.77±1.04^{A}	2.41±0.58^{A}
Red wine	7	13.36±3.04^{A}	11.00±1.30^{B}
	30	19.85±2.04^{A}	13.13±1.07^{B}
	150	24.26±2.53^{A}	15.57±1.20^{B}
Coffee	7	11.23±3.69^{A}	2.81±0.53^{B}
	30	17.77±3.64^{A}	3.93±1.22^{B}
	150	23.28±4.62^{A}	4.95±1.25^{B}
Coca-Cola	7	1.24 ±0.58^{A}	1.11±0.56^{A}
	30	1.76±1.02^{A}	1.40±0.71^{A}
	150	1.93±0.67^{A}	2.05±0.73^{A}

* The different capital letters in the same row compare different group of study (non-surface sealant coating group and non-surface sealant coating group) which represent significant differences in the mean color change of provisional restoration material at 5% level of significant ($p<0.05$).

Table 4 The mean color change (ΔE) of provisional restoration materials in the non-surface sealant coating group after immersion in distilled water, red wine, coffee, and Coca-Cola beverages at 7 days, 30 days, and 150 days (n=12)

	Beverages	Days 7	Days 30	Days 150
Group 1: Non-surface sealant coating	Distilled water	2.27^{Aa}	2.40^{Aa}	2.77^{Aa}
	Red wine	13.36^{Ba}	19.85^{Bb}	24.26^{Bc}
	Coffee	11.23^{Ca}	17.77^{Cb}	23.29^{Bc}
	Coca-Cola	1.24^{Aa}	1.76^{Aa}	1.93^{Aa}

*The different capital letters in the same column compare different beverages and the lowercase letters in the same row compare different time of immersion which represent significant differences in the mean color change of provisional restoration material at 5% level of significant ($p<0.05$).

Figure 1 Mean color change (ΔE) of provisional restoration materials in non-surface sealant coating group after immersion in beverages

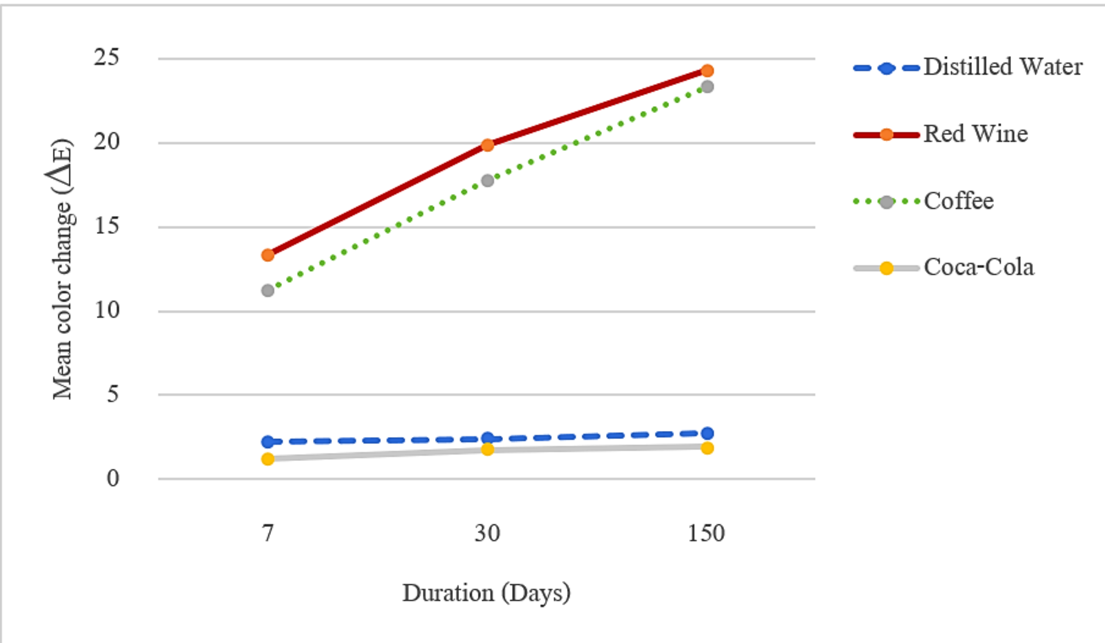
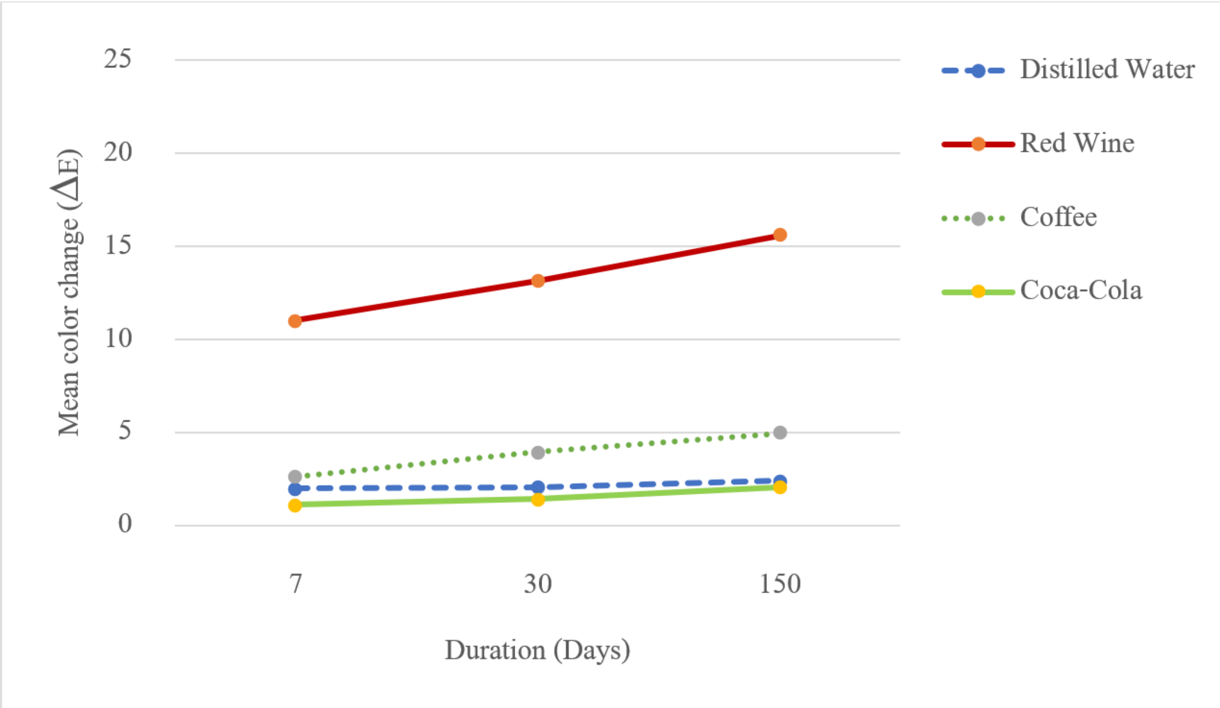


Table 5 The mean color change (ΔE) of provisional restoration materials in the surface sealant coating group after immersion in distilled water, red wine, coffee, and Coca-Cola beverages at 7 days, 30 days, and 150 days (n=12)

	Beverages	Days 7	Days 30	Days 150
Group2: surface sealant coating	Distilled water	1.97[Aa]	2.06[Aa]	2.41[Aa]
	Red wine	11.00[Ba]	13.13[Bb]	15.57[Bc]
	Coffee	2.61[Aa]	3.93[Cab]	4.95[Cb]
	Coca-Cola	1.11[Aa]	1.40[Aa]	2.05[Aa]

*The different capital letters in the same column compare different beverages and the lowercase letters in the same row compare different time of immersion which represent significant differences in the mean color change of provisional restoration material at 5% level of significant ($p<0.05$).

Figure 2 Mean color change (ΔE) of provisional restoration materials in surface sealant coating group after immersion in beverages



Discussion

Color stability is a key condition for provisional restoration, and has been described as the material's capacity to retain its initial shade. Various types of provisional restoration materials undergo color changes when exposed to environmental conditions. This study evaluated the effect of a surface sealant coating agent (Luxatemp-Glaze and Bond) on the color stability of bis-acryl composite resins (Luxacrown) after immersing in various beverages for long periods of time (7, 30 and 150 days).

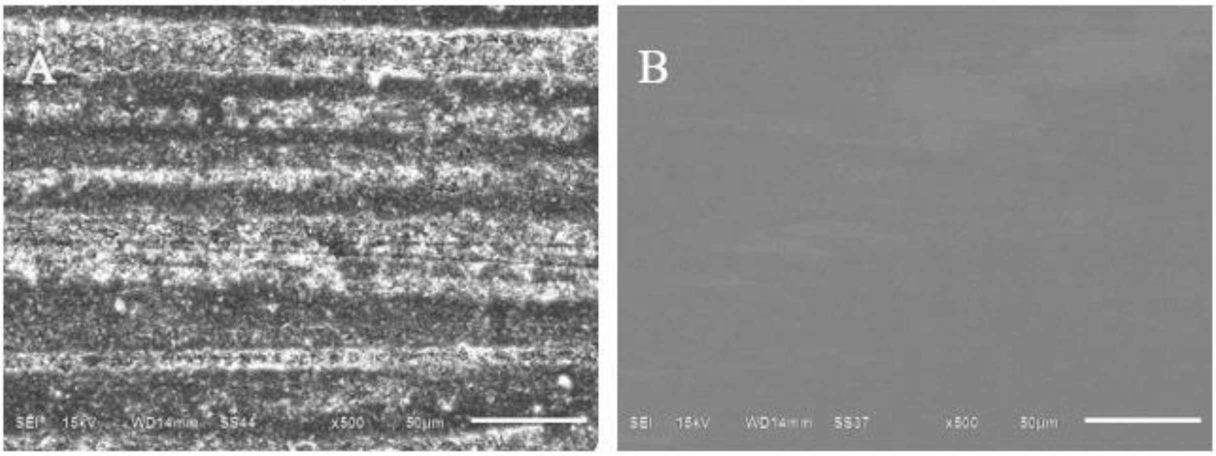
Color is one of the most significant esthetic characteristics in dentistry, and the most frequently used method of evaluating color in dentistry is visual judgment. To evaluate color differences, two basic thresholds are employed: perceptibility threshold (PT) and acceptability threshold (AT). The PT represents the lowest color change that a viewer can identify, whereas the AT indicates the smallest color difference that an observer can accept.[16] According to Paravina et al., the ΔE for PT and AT was 1.22 and 2.66, respectively.[17] If the color changes were valued greater than 2.66, they were considered clinically unacceptable. In this study, ΔE_{DW} and ΔE_{CC} were less than 2.66 in both groups, except ΔE_{DW} at days 150 in Group 1, demonstrating more than 2.66. However, ΔE_{RW} and ΔE_{CF} were above 2.66 in both groups, except ΔE_{CF} in Group 2 at day 7 showing a value less than 2.66. (ΔE_{DW} is the mean color change of distilled water, ΔE_{CC} is the mean color change of Coca-Cola, ΔE_{RW} is the mean color change of red wine and ΔE_{CF} is the mean color change of coffee) In this study, Group2 showed better color stability in red wine and coffee in a short period of immersion (7 days). On the contrary, for long-term immersion period, provisional restorative materials exhibited clinically unacceptable color change.

Surface sealant coating agents are recommended for the quality of the smoothness of materials by filling the microfissures and defects that form after polishing procedures.[18] However, the surface sealant coating agent may lead to problems such as poor surface quality resulting from high viscosity of the sealant and too rapid curing causing uneven spreading.[19] The related SEM microphotograph revealed that Groups 1 and 2 possessed completely different surfaces. Group 1 revealed many deep, large scratches and porous structures, whereas Group 2 exhibited few shallow scratches and a totally distinct smooth surface (Figure 3). Furthermore, the use of a surface sealant coating agent in this study resulted in a significant difference in lower ΔE values for specimens immersed in high staining potential beverages such as red wine and coffee, even though they were clinically unacceptable.

The provisional restorative materials were discolored to varying degrees by several beverages used in this study. The discoloration could be caused by both colorant absorption and adsorption. Small particles may have accumulated in material pits, but large particles exposed on the surface will generate surface roughness.[20]

Beverages including coffee, tea, red wine and sport drinks are known for extrinsic discoloration factors in common daily use.[11] In many studies,[21-24] red wine and coffee caused the greatest color change when contacting resins and the results in this study also agree with those of related studies.

Figure 3 SEM image of surface of each provisional restorative material before immersion in beverages (x500), scale bar 50 µm: (A) Group 1: non-surface sealant coating; (B) Group 2: surface sealant coating



Coffee and tea contain tannin, a brown pigment that can discolor teeth and provisional restoratives. Tannins are high molecular weight molecules that can form insoluble compounds with carbohydrates and proteins.[25] According to Snyder et al.,[26] in reverse phase high performance liquid chromatography analysis comparing between coffee and tea, the stationary phase is relatively nonpolar, while the mobile phase is polar. Because the yellow colorants of coffee are less polar and less hydrophilic, they were eluted later and resulted in less discoloration than tea consisting of more polar yellow colorants.[27]

The main pigments in red wine are anthocyanins and their derivatives.[28] It may have a considerable impact on the color change of provisional restorative materials during aging, resulting in more color change of materials immersed in red wine.[29]

Quite possibly, the acidic pH influenced the materials' structure. Low pH beverages (pH 3–6) damaged the surface integrity of a compomer by softening the matrix and loss of structural ions such as calcium, aluminum, phosphorus and silicon.[30, 31] Initial pH of beverages was measured with pH meter. The pH of distilled water, red wine, coffee and Coca-Cola were 7, 3.7, 5.3 and 2.6, respectively. Although Coca-Cola had the lowest pH and could harm the materials' surface integrity, it did not discolor as much as coffee and tea, which could be due to the lack of a yellow colorant in Coca-Cola.

ΔE_{RW} and ΔE_{CF} in both experiment groups revealed significant differences in long immersion periods. In Group 1, ΔE_{RW} showed significant differences between days 7 and 150, while ΔE_{RW} in Group 2 exhibited significantly differences in all measurements. ΔE_{CF} in both groups displayed significant difference between measurement in days 7 and 150. Therefore, within 30 days, specimens with surface sealant coating immersed in coffee had better color stability than that in red wine.

The color changing mechanism of materials can be described by the water absorption[32]and filler content, incomplete polymerization and the existence of air bubbles.[33] Thus, long immersion time might cause excessive water absorption and shorten the lifetime of composite resins by expanding and plasticizing the resin components and producing microcracks at the filler and matrix interface resulting in stained or discolored provisional restorative materials.[30] The color change of provisional restorative materials depends on chemical and physical properties of materials.[6] A research question remains as to which type of material has better color stability. Further studies of different materials such as polymethyl methacrylate, polyethyl methacrylate and other commercial Bis-acryl composite resins should be studied. Also, experiments including various types of surface sealant coating agents and analyzing the color stability after thermocycling that simulated the oral environment should be considered.

Conclusion

The effect of surface sealant coating agent on color stability of Luxacrown, a bis-acryl composite resin after immersing in different beverages at various immersion times was examined. Within the limitations of this study, it could be concluded that applying surface sealant coating agent helps improve the color stability of Bis-acryl composite resin, especially in a short period. Moreover, different beverages also affect the color stability of this material.

References

1. Rosenstiel SF, Land MF, Fujimoto J. Contemporary fixed prosthodontics. 5th ed: wlsevier health sciences; 2016:401-04.
2. Shillingburg HT, Sather DA, Wilson EL,Cain JR, Mitchell DL, Blanco LJ, et al. Fundamental of fixed prosthodontics. 4th ed. Chicogo:Quintessence;2012.
3. Gujjari AK, Bhatnagar VM, Basavaraju RM. Color stability and flexural strength of poly (methyl methacrylate) and bis-acrylic composite based provisional crown and bridge auto-polymerizing resins exposed to beverages and food dye: an *in vitro* study. Indian J Dent Res 2013;24(2):172-7.

4. Guler AU, Kurt S, Kulunk T. Effects of various finishing procedures on the staining of provisional restorative materials. J Prosthet Dent 2005;93(5):453-8.
5. Turgut S, Bagis B, Ayaz EA, Ulusoy KU, Altintas SH, Korkmaz FM, et al. Discoloration of provisional restorations after oral rinses. Int J Med Sci 2013; 10(11):1503-9.
6. Sham AS, Chu FC, Chai J, Chow TW. Color stability of provisional prosthodontic materials. J Prosthet Dent 2004;91(5):447-52.
7. Doray PG, Li D, Powers JM. Color stability of provisional restorative materials after accelerated aging. J Prosthodont 2001;10:212-6.
8. Sarac D, Sarac YS, Kulunk S, Ural C, Kulunk T. The effect of polishing techniques on the surface roughness and color change of composite resins. J Prosthet Dent 2006;96(1):33-40.
9. Perez CdR, Hirata Jr R, Silva A, Sampaio E, Miranda M. Effect of a glaze/composite sealant on the 3-D surface roughness of esthetic restorative materials. Oper Dent 2009;34(6):674-80.
10. Lowe RA. Using BisCover surface sealant/polish on direct and indirect composite and bisacrylic provisional restorations. Compend Contin Educ Dent 2004; 25(5):400-1.
11. Bagheri R, Burrow M, Tyas M. Influence of food-simulating solutions and surface finish on susceptibility to staining of aesthetic restorative materials. J Dent 2005;33(5):389-98.
12. Sulaiman TA, Suliman AA, Mohamed EA, Rodgers B, Altak A, Johnston WM. Optical properties of bisacryl, composite, ceramic resin restorative materials: An aging simulation study. J Esthet Restor Dent 2021; 33(6):913-8
13. Gómez-Polo C, Muñoz MP, Luengo, MCL, Vicente P, Galindo P,Casado, AM. Comparison of two color-difference formulas using the Bland-Altman approach based on natural tooth color space. J Prosthet Dent 2016;115(4), 482-88.
14. Kim JG, YU B, Lee YK. Correlation between color differences based on three color-difference formulas using dental shade guide tabs. J Prosthet Dent 2009;18(2):135-40.
15. CIE Technical report: colorimeter commission internationale de l'eclairage CIE 15 3rd ed. Vienna: Bureau Central de la CIE2004.
16. International Organization for Standardization. ISO/TR 28642 Dentistry—Guidance on color measurement. Geneva: International Organization for Standardization; 2011.
17. Paravina RD, Ghinea R, Herrera LJ, Bona AD, Igiel C, Linninger M, et al. Color difference thresholds in dentistry. J Esthet Restor Dent 2015;27(Suppl 1):S1-9.
18. Sahin O, Koroglu A, Dede DÖ, Yilmaz B. Effect of surface sealant agents on the surface roughness and color stability of denture base materials. J Prosthet Dent 2016;116(4):610-6.
19. Borchers L, Tavassol F, Tschernitschek H. Surface quality achieved by polishing and by varnishing of temporary crown and fixed partial denture resins. J Prosthet Dent 1999;82(5):550-6.
20. Maalhagh-Fard A, Wagner WC, Pink FE, Neme AM. Evaluation of surface finish and polish of eight provisional restorative materials using acrylic bur and abrasive disk with and without pumice. Oper Dent 2003;28(6):734-9.
21. Macedo MGFP, Volpato CAM, Henriques BAPC, Vaz PCS, Silva FS, Silva CFCL. Color stability of a bis-acryl composite resin subjected to polishing, thermocycling, intercalated baths, and immersion in different beverages. J Esthet Restor Dent 2018; 30(5):449-56.
22. Stober T, Gilde H, Lenz P. Color stability of highly filled composite resin materials for facings. Dent Mater 2001;17(1):87-94.
23. Guler AU, Yilmaz F, Kulunk T, Guler E, Kurt S. Effects of different drinks on stainability of resin composite provisional restorative materials. J Prosthet Dent 2005;94(2):118-24.

24. Nagaviroj N, Kotnarin N, Kanchanavasita W. The effect of staining solutions on the color stability of the provisional restorative materials. M Dent J 2018;38(3): 309-318
25. Bravo L. Poly-phenols: chemistry, dietary sources, metabolism, and nutritional significance. Nutr Rev 1998;56(11):317-33.
26. Snyder LR, Kirkland JJ, Dolan JW. Introduction to modern liquid chromatography: John Wiley & Sons; 2011.
27. Um CM, Ruyter I. Staining of resin-based veneering materials with coffee and tea. Quin Int 1991;22(5):377-86.
28. Fernandes A, Oliveira J, Teixeira N, Mateus N, De Freitas V. A review of the current knowledge of red wine colour. Oeno One 2017;51(1):1-21.
29. Tanthanuch S, Kukiattrakoon B, Peerasukprasert T, Chanmanee N, Chaisomboonphun P, Rodklai A. The effect of red and white wine on color changes of nanofilled and nanohybrid resin composites. Restor Dent Endod 2016;41(2):130-6.
30. Erdemir U, Yıldız E, Eren MM . Effects of sports drinks on color stability of nanofilled and microhybrid composites after long- term immersion. J Den 2012; 40(Suppl 2):55-63.
31. Watts D. pH and time dependence of surface degradation in a compomer biomaterial. J Dent Res 1995;74:912.
32. Watts A, Addy M . Tooth discolouration and staining : a review of the literature. Br Dent J 2001;190(6):309-16.
33. Braden M, Clarke RL. Water absorption characteristics of dental microfine composite filling materials. I. Proprietary materials. Biomaterials 1984;5(6):369-72.

Corresponding Author

Noppavan Nagaviroj

Department of Prosthodontics,

Faculty of Dentistry, Mahidol University,

Ratchathewi, Bangkok, 10400.

Tel. : +66 2 200 7817-18

E-mail : noppavan.nag@mahidol.ac.th

ผลของสารเคลือบพื้นผิววัสดุทำครอบฟันชั่วคราวและชนิดเครื่องดื่ม ต่อเสถียรภาพสีวัสดุทำครอบฟันชั่วคราว

ธนิศา ศิริทัพ วิชญ กาญจนะวสิต* นพวรรณท์ นาควิโรจน์**

บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อศึกษาผลของสารเคลือบพื้นผิววัสดุทำครอบฟันชั่วคราวและสารละลายติดสีต่อเสถียรภาพสีวัสดุทำครอบฟันชั่วคราว โดยเตรียมกลุ่มตัวอย่างรูปร่างแผ่นกลมจำนวน 96 ชิ้น ด้วยวัสดุทำครอบฟันชั่วคราวคือ ลักซาคราวน์ แบ่งกลุ่มตัวอย่างเป็น 2 กลุ่ม กลุ่มละ 48 ชิ้นโดยการสุ่ม ในกลุ่มที่ 1 คือกลุ่มตัวอย่างที่ไม่ได้เคลือบด้วยสารเคลือบพื้นผิว และกลุ่มที่ 2 คือเคลือบผิวหน้าด้วยสารเคลือบพื้นผิว ลักซาเทม เกลซ แอนด์บอนด์ นำตัวอย่างในแต่ละกลุ่มแบ่งแช่ในเครื่องดื่ม 4 ชนิด (12 ชิ้นตัวอย่างต่อสารละลาย) คือ น้ำกลั่น ไวน์แดง กาแฟ และโค้ก เก็บกลุ่มตัวอย่างไว้ในตู้ควบคุมอุณหภูมิ วัดค่าสีด้วยเครื่องสเปกโทรโฟโตมิเตอร์ก่อนเริ่มการทดลอง และหลังการทดลองในวันที่ 7 30 และ 150 ตามลำดับ นำค่าจากการทดลองมาคำนวณหาค่าเสถียรภาพสี แล้วนำไปวิเคราะห์ข้อมูลโดยใช้สถิติการทดสอบความแปรปรวนแบบผสม ที่ระดับนัยสำคัญ 0.05 ผลการศึกษาพบว่า กลุ่มที่ 1 มีการเปลี่ยนแปลงของค่าเฉลี่ยเสถียรภาพสีมากกว่ากลุ่มที่ 2 เมื่อแช่ในไวน์แดง และ กาแฟ อย่างมีนัยสำคัญทางสถิติ กลุ่มตัวอย่างที่แช่ในกาแฟมีค่าสีที่เปลี่ยนแปลงไปน้อยกว่า กลุ่มตัวอย่างที่แช่ในไวน์แดงในทุกค่าการวัดผล ยกเว้น การวัดผลของกลุ่มที่ 1 ในวันที่ 150 หลังการทดลอง นอกจากนี้ยังพบว่าชนิดเครื่องดื่มที่แตกต่างกันส่งผลต่อกลุ่มตัวอย่างในทุกช่วงเวลาในการวัดผล กล่าวโดยสรุปคือ สารเคลือบพื้นผิว ชนิดเครื่องดื่ม และระยะเวลาที่แช่ตัวอย่าง มีผลต่อเสถียรภาพสีวัสดุ ทำครอบฟันชั่วคราว

คำไขรหัส: *วัสดุทำครอบฟันชั่วคราว/ เสถียรภาพสี/ เครื่องดื่ม/ สารเคลือบพื้นผิว*

ผู้รับผิดชอบบทความ

นพวรรณท์ นาควิโรจน์
ภาควิชาทันตกรรมประดิษฐ์
คณะทันตแพทยศาสตร์ มหาวิทยาลัยมหิดล
ราชเทวี กรุงเทพฯ 10400
โทรศัพท์ : 02 200 7817-18
จดหมายอิเล็กทรอนิกส์ : noppavan.nag@mahidol.ac.th

** ภาควิชาทันตกรรมประดิษฐ์ คณะทันตแพทยศาสตร์ มหาวิทยาลัยมหิดล กรุงเทพฯ*