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Original Research

Assessing Color Stability of Esthetic Restorative Material in Chlorhexidine Mouthwash through Spectrophotometric Analysis

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ABSTRACT:

Aim: The aim of the study is to assess the color stability of nanofilled and microhybrid dental composite resins when exposed to chlorhexidine mouthwash.**Materials and Methods:**Thirty specimens (15 specimens for each group) were crafted using a composite filling instrument. Each specimen measured 12 mm × 4 mm and was of A1 shade. All prepared samples were individually submerged in 30 ml of distilled water in separate containers based on their respective groups. Following a 24-hour immersion period, baseline color values of each sample were measured using a spectrophotometer.Following initial color measurements, 15 randomly chosen specimens per group were immersed in 30 ml of clohex ADS mouthwash for 24 hours. Data analysis was performed using SPSS.**Results:** Both samples exhibited color changes after immersion in the mouthwash, yet these changes were not statistically significant.**Conclusion:** The study's conclusion highlights that nanofilled composite resins demonstrate higher colorimetric stability than microhybrid composites when subjected to chlorhexidine mouthwash exposure.

Keywords:resin, composite, mouthwash

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INTRODUCTION

The enduring color stability of esthetic restorative materials is critical, as poor color matching often leads to the replacement of composite resin restorations.[1] Given their excellent esthetic qualities, resin composite materials are extensively utilized in clinical settings. The ability of any esthetic restorative material to replicate the natural tooth's color is paramount, with the efficacy of the restoration primarily contingent on both color matching and long-term color stability.[2] Nevertheless, prolonged exposure to the oral environment frequently results in discoloration of the restorative material, posing a significant drawback.[3]

The discoloration of composite resin materials can stem from intrinsic or extrinsic factors.[4] Extrinsic discoloration primarily arises from the presence of colorants in beverages and foods. In vitro studies have consistently shown that commonplace drinks and food constituents have the potential to induce noticeable alterations in surface color.[5, 6]

The surface smoothness and vulnerability to extrinsic staining are directly influenced by the structure of the resin matrix and the properties of the filler particles.[7] The propensity for staining can be attributed to both the composition of the resin matrix and the size of the filler particles.[8]The resin matrix notably impacts the color stability of esthetic restorative materials. Its susceptibility to stains is influenced by factors such as conversion rate and chemical properties, with water sorption rate being particularly significant.[9]

Mouthwashes are extensively utilized globally, often without a prescription, to address various dental issues.[10] They serve as adjuncts in the treatment of conditions like gingivitis, periodontitis, halitosis, and caries prevention. Mouthwashes come in diverse formulations, incorporating components such as fluoride, antimicrobial agents, preservatives, salt, alcohol, and various flavors.[11] Despite their benefits, frequent use of mouthwash may adversely affect dental restorations and oral tissues.These mouthwashes comprise ingredients such as moisturizers, flavorings, colorings, and stabilizers.[12] Dental aesthetics holds paramount importance for patients, with particular emphasis placed on preserving ideal color stability between natural teeth and dental restorations over the long term. Therefore, this study aims to investigate the impact of nonalcoholic mouthwash on the color stability of nanofilled and microhybrid dental composite resins.

MATERIALS AND METHODS

Thirty specimens (15 specimens for each group) were crafted using a composite filling instrument. Each specimen measured 12 mm × 4 mm and was of A1 shade. Stainless steel molds were utilized in the preparation process. Polymerization of the composite material was conducted for 20 seconds from both the top and bottom by an LED light-curing unit. Group A included Microhybrid composite while group B included nanohybrid composite. Chlorhexidine gluconate 0.20% was used. All prepared samples were individually submerged in 30 ml of distilled water in separate containers based on their respective groups. Following a 24-hour immersion period, baseline color values of each sample were measured using a spectrophotometer. Additionally, a separate scale was employed for determining the colorimetric values of the specimens.Following initial color measurements, 15 randomly chosen specimens per group were immersed in 30 ml of clohex ADS mouthwash for 24 hours. After rinsing and drying, spectrophotometric analysis was conducted to assess color changes. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

RESULTS

Table 1 presents a comparison of color change between Group A and Group B composite. Mean color change among patients of group A and group B was 4.168 and 4.813 respectively. Utilizing a t-test, the analysis revealed no statistically significant difference between the groups.Both samples exhibited color changes after immersion in the mouthwash, yet these changes were not statistically significant.

Table 1: Comparison of color change

Group	Mean	SD
Group A	4.168	0.953
Group B	4.813	0.774
p-value	0.001 (Significant)	

DISCUSSION

The esthetic expectations of patients have increased over the years, and this has led to an increase in the clinical use of resin composites. The resin composites consist of a resin matrix and inorganic particles that have been chemically and physically designed to meet esthetic requirements. For this reason, they come in different colors or shades that resemble enamel and dentin. Among its advantages as a restorative material is its chromatic similarity to teeth.

One of the most crucial success criteria for restorative dentistry is to ensure long-term color stability and harmony. In recent years, there have been improvements in resin composite formulation mainly through the use of nanotechnology. Nanohybrid resin composites contain nanoscale inorganic particles dispersed in the resin matrix that result in a more polished surface, less shrinkage, color stability and improved esthetics. However, despite the advancement in resin composite technology, a major problem is color stability in the oral cavity.[10- 13]

Mean color change among patients of group A and group B was 4.168 and 4.813 respectively. Utilizing a t-test, the analysis revealed no statistically significant difference between the groups.Both samples exhibited color changes after immersion in the mouthwash, yet these changes were not statistically significant.Kalita et al evaluated the surface roughness and colour stability of three nanohybrid composite resins post-exposure to mouth rinse and colouring beverages.One hundred and twenty specimens of dimension 10 mm x 8 mm x 1 mm were randomly allocated into three equal-sized groups and fabricated using three different nanohybrid composites (Group A: Filtek Z250 XT, Group B: Tetric N-Ceram, and Group C: Solare Sculpt). Sixty samples, comprising 20 from each group, were examined for colour stability and 60 for surface roughness after exposure to chlorhexidine and coffee. Baseline and post-exposure readings of the surface roughness and colourabsorbance of the specimens were obtained by atomic force microscopy and spectrophotometer, respectively. Irrespective of the composite, the surface roughness and colour change were substantially higher in the samples exposed to coffee (p-value<0.01). Filtek Z 250XT showed significantly minor changes in colour and surface roughness, followed by Solare Sculpt and Tetric N-Ceram (p-value<0.05).Coffee caused more

surface roughness and colour changes compared to chlorhexidine.[14]Khosravi, M et al evaluated the effects of chlorhexidine mouthrinses on color stability of nanofilled and micro-hybrid resin-based composites.160 disc-shaped specimens (7x2mm) were fabricated of Filtek Z250 and Filtek Z350XT Enamel (A2 shade). The samples of each group were randomly divided into eight subgroups (n=10). The specimens were incubated in artificial saliva at 37°C for 24 hours. The baseline color values (L*, a*, b*) of each specimen were measured according to CIE LAB system using a reflection spectrophotometer. After baseline color measurements, the control samples were immersed in saliva and the test groups were immersed in Kin (Cosmodent), Vi-One (Rozhin), Epimax (Emad), Hexodine (DonyayeBehdasht), Chlorhexidine (Shahrdaru), Najo (Najo) and Behsa (Behsa) mouthrinses once a day for two minutes. The specimens were then immersed again in saliva. All specimens displayed color change after immersion in the mouthrinses. Significant interactions were found between the effects of materials and mouthrinses on color change.All composite resins tested showed acceptable color change after immersion in different mouthrinses. Filtek Z350XT showed less color change than Filtek Z250.[15]

CONCLUSION

The study's conclusion highlights that nanofilled composite resins demonstrate higher colorimetric stability than microhybrid composites when subjected to chlorhexidine mouthwash exposure.

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