

The Effect of Smoking on Feldspathic Porcelain and Zirconia Crowns.

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Abstract: *The use of ceramics in restorative dentistry is highly popular due to their biocompatibility, pleasing aesthetics, insolubility, and hardness. However, cigarette smoking remains widespread and significantly impacts the long - term aesthetic outcomes of restorations. This study investigates the color stability and stainability of feldspathic porcelain and zirconia crowns in their polished and glazed states, with particular focus on exposure to cigarette smoke. The study compares color changes between these two materials using the Vita Shade system. Forty patients were included, and their crowns were assessed for color changes over time. The findings indicate that both materials experience significant color shifts, with smoking being a notable contributing factor. The study highlights the need for further research on color stability in the context of new dental materials.*

Keywords: Smoking, color stability, stainability, feldspathic porcelain, zirconia

1. Introduction

Discoloration is a significant cause of aesthetic restoration failures. Porcelain discoloration can result from either intrinsic or extrinsic factors. Typically, color changes are caused by external discolorations from plaque buildup and stains, surface changes that promote degradation and allow colorant penetration, and intrinsic discolorations due to physicochemical reactions within the restorative material [1, 2, 3, 4, 5]. Ceramic restorations done with traditional laboratory techniques can offer mechanical and optical properties, as well as marginal adaptation, comparable to those produced with modern methods [6]. The development of computerized technology has made it possible to mass - produce materials like silica ceramics, infiltration ceramics, high - performance oxide ceramics, and methacrylate polymers in ingot form, leading to higher consistency and homogeneity [7]. Manufacturers prepare zirconia powders to press and create green sintered blanks for CAD restorations [8, 9]. Color stability and stainability are essential properties; color stability involves changes over time in saliva, while stainability involves changes due to exposure to staining agents. Treatments like surface finishing, adjustments, and polishing can increase the roughness of CAD materials, which can enhance stainability and affect opposing teeth [10, 11].

2. Method and Material

The present study was conducted in the dental department at King Hussein Medical City in Amman, Jordan. Forty patients were divided into two groups: one receiving feldspathic porcelain PFM (P) crowns (n=20), and the other receiving zirconia (Zr) crowns (n=20). The aim was to study the effect of smoking on the color of both types of crowns. Color measurements were taken using Vita Shade as a baseline after cementation and during the follow - up visit. Statistical analysis was performed using a one - way method. Color change was assessed using ΔE values for both the P and Zr groups on the 30th day, and a comparison was made. The

results showed that both groups experienced similar color changes. However, the one - way test revealed a statistically significant difference in the mean color change between the exposures for each group ($p < 0.01$).

3. Discussion

The relationship between color stability, stainability, and surface roughness must be considered. Both polished and glazed finishes of PM and Zr did not show an increase in stainability. Exposure to cigarette smoke indicated that both PM and Zr crowns are prone to staining, but they responded differently in terms of shade changes. Our results align with previous research showing that smoke and tobacco exposure can cause surface alterations in ceramic restorations [12] and dental composites [13], resulting in decreased luminosity and darker crowns. The staining of these materials may be due to tar and metals like arsenic, lead, and cadmium found in tobacco, as well as dark components of smoke that settle on the surface, affecting color and luminosity [14]. Degradation processes can lead to structural breakdown in Zr, increased surface roughness, and microcrack formation, which enhance light scattering and reduce translucency [15, 16]. Surface finishing of feldspathic porcelain and zirconia, whether glazed or polished, did not influence their stainability and exhibited high ΔE values. After cigarette smoke exposure, considerable smoke residue was found on the crown surfaces, resulting in high average ΔE values ranging from 11.8 to 20.2. This study is significant as it provides insights into how smoking can impact the longevity and aesthetics of dental restorations, helping dentists make informed choices about materials based on patient lifestyle factors.

4. Conclusion

The study concludes that both feldspathic porcelain and zirconia crowns exhibit significant staining when exposed to cigarette smoke, with observable differences in color stability. Further research should investigate the effects of other staining agents, such as beverages and mouth rinses, to

develop comprehensive guidelines for dental restoration. Exposure to cigarette smoke resulted in noticeable staining of feldspathic porcelain and zirconia crowns. It is also important to note that regular oral hygiene practices can effectively reduce surface stains.

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