

Changes in color and roughness of dental porcelain exposed to coffee before and after bleaching

Background

Some patients noticed the color change of their prosthesis; which made it less esthetic. In recent years, dental bleaching has become popular to improve esthetic. While some studies said bleaching could increase surface roughness which led to plaque accumulation and staining, investigations about the effects of bleaching procedures on IPS e.max Press are still controversy.

Thus, it is interesting to prove the effectiveness and benefits of this procedures.

Objective

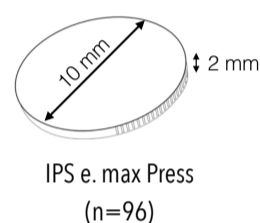
This study was evaluated the change of color and surface roughness of autoglazed and overglazed, with and without polishing, IPS e.max Press when exposed to coffee and bleaching agent.

Methology

A total of 96 specimens (10x10x2 mm³) were separated into 4 groups (n=24); polished autoglazed, unpolished autoglazed, polished overglazed, and unpolished overglazed. The specimens were immersed in coffee. The controlled group was immersed in distilled water and bleached with 35% carbamide peroxide (in-office bleaching). The change of color and surface roughness values were evaluated using a spectrophotometer and surface roughness tester before and at 45 days of coffee immersing and after bleaching.

Data analysis

The color change would be analyzed by Novascan program. Statistical software SPSS 24 was used for analyzing all of the data. F-test was applied to see variance, then paired-T test was applied to see a significant difference in 2 samples.



- Unpolished + Autoglazed
- Unpolished + Overglazed
- Polished + Autoglazed
- Polished + Overglazed



Immersed in distilled water



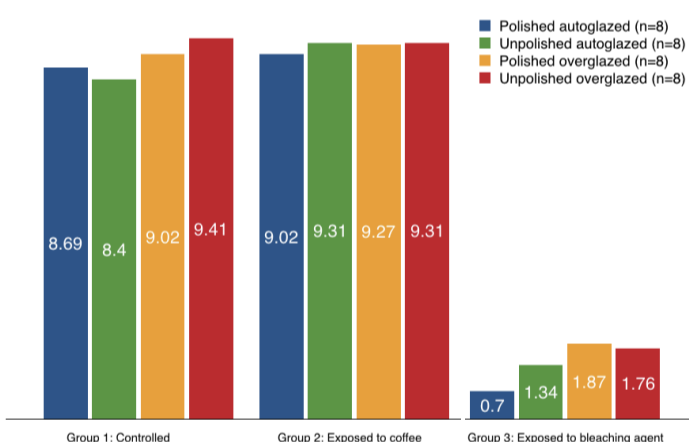
Immersed in coffee



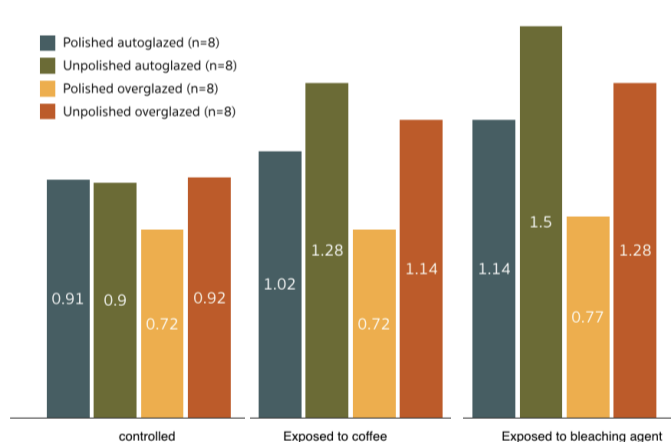
Evaluate surface roughness and color change

Result

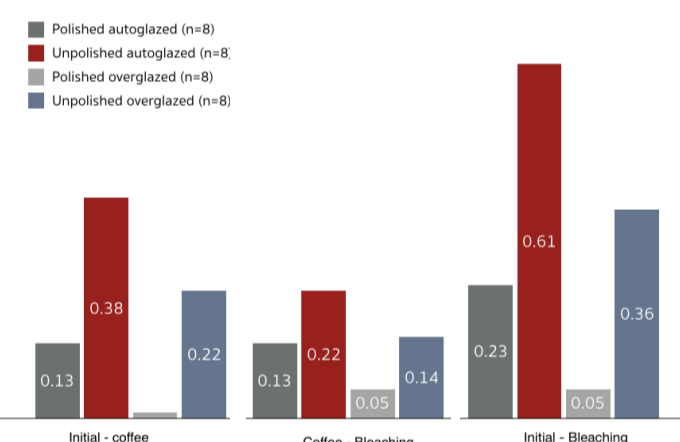
Color change value (ΔE)



Roughness (Ra) value



Surface roughness change value (ΔRa)



Discussion

In this study, there was no significant difference of color change between coffee immersed and controlled groups. However, ΔE of both groups were greater than the minimum value that human eye could detect. The cause of color change in controlled group might come from silica network dissolution and stained from coffee diffusion across the plastic container. For bleaching groups, there were statistically significant change of color after exposed to bleaching agent in all surface treatment groups.

The Ra values of autoglazed groups significantly changed after immersed in coffee. This might also be caused by acidic effect that significant changed of surface roughness in most group, especially in polishing groups.

When compared ΔE and ΔRa between polished and unpolished groups. The results illustrated that there was no statistically significant difference in all tests except ΔRa between initial and after bleaching in overglazed groups. Which meant that polishing procedure still had some effects to color staining and surface roughness changes, especially surface roughness change of overglazed group when exposed to coffee then bleaching. However, polished specimens had equal or less Ra values when compared to unpolished specimens. Therefore, polishing procedure still suggested.

Comparing ΔE and ΔRa between autoglazed and overglazed groups showed statistically significant difference in ΔE between unpolished autoglazed and overglazed in controlled groups. For ΔRa , there were statistically significant difference when compared between initial and coffee immersion, initial and after bleaching in polished groups. These results showed that glazing had weak influence on color change of specimens in most tests. On the other hand, glazing had significant effect to change in surface roughness of specimens in most tests. Overglazed groups also showed less change in surface roughness when immersed in coffee and exposed to bleaching agent. So, overglazing procedure should be performed to avoid increasing in surface roughness.

Conclusion

For IPS e.max Press, immersion either in water or coffee caused insignificant change in color. However, the color change values (ΔE) of both groups were greater than the maximum value that human eye cannot detect. There were significant change of surface roughness in polished and unpolished autoglazed groups after immersed in coffee.

For bleaching groups, there were significant changes of color after exposed to bleaching agent in all surface treatment groups. Bleaching agent could also affect the changed of surface roughness significantly in polished autoglazed and polished overglazed groups. From ΔE and ΔRa results, bleaching was not recommended for IPS e.max Press because they could affect color and surface roughness change of the restorations. Comparison between polished and unpolished specimens, polished specimens had equal or less Ra values when evaluated after coffee immersion and bleaching. Therefore, polishing procedure still suggested in clinical use.

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Keywords : bleaching coffee color changes IPS e.max Press surface roughness