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Bond Strengths of All-Ceramics: Acid vs. Laser Etching

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Various applications of dental lasers on dental materials have been proposed for surface modifications. This study evaluated whether laser etching could be an alternative to hydrofluoric acid (HF) etching. One hundred and ten lithia-based all-ceramic specimens (IPS Empress 2, Ivoclar Vivadent AG, Schaan, Liechtenstein) (R: 4 mm, h: 4 mm) were prepared and divided into five groups (n = 22/group). The untreated specimens served as the control, while one of the experimental groups was treated with 9.5% HF for 30 seconds. Three remaining test groups were treated with different Er:YAG laser (Opus Duo, OpusDent, Tel Aviv, Israel, wavelength 2940 nm) power settings: 300 mJ, 600 mJ, and 900 mJ. Ten specimens in each group were luted to the other 10 specimens by a dual-curing cement (Variolink II, Ivoclar Vivadent AG, Schaan, Liechtenstein), and shear-bond strength (SBS) tests were performed (Autograph, crosshead speed: 0.5 mm/minute). The results were statistically analyzed (Kruskal Wallis and Mann Whitney-U, a = .05).

Results

Mean SBS (MPa) were 31.9 ± 4.0 , 41.4 ± 4.3 , 42.8 ± 6.2 , 29.2 ± 4.5 , and 27.4 ± 3.8 for the control and HF, 300, 600 and 900 mJ groups, respectively. Scanning electron microscope (SEM) evaluations revealed different surface morphologies depending on the laser parameters. The differences between HF acid and 300 mJ, when compared with the control, 600 and 900 mJ groups, were significant (p < .05). The 300 mJ laser group exhibited the highest shear-bond strength values, indicating that laser etching could also be used for surface treatments.

Conclusion

For surface modification of the inner surfaces of ceramic restorations, the etching pattern obtained by dental lasers could be an alternative to conventional acid etching.

Biography: *Dr. Bülent Gökçe was born in Turkey in 1974 and graduated from Ege University School of Dentistry in 1998. He is a research assistant in Ege University School of Dentistry Department of Prosthodontics. His main interests are lasers, implantology, and ceramics.*

Disclosure: *Dr. Gökçe has no commercial affiliations.*

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