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Effect of Irrigation Protocols on Sealer Penetration Determined by Specific Fluorophore

A. Ivica¹, I. Šalinović¹, M. Zehnder², S. Jukić Krmek¹, I. Miletić¹

¹Department of Endodontics and Restorative Dentistry, University of Zagreb School of Dental Medicine, Zagreb, Croatia, ²Clinic of Conservative and Preventive Dentistry, University of Zurich, Zurich, Switzerland

Objectives To assess the effect of sequential versus continuous chelation in root canal irrigation on the penetration depth of a calcium silicate-based sealer, mixed with a specific fluorophore dye.

Methods Forty single-rooted teeth were selected and prepared using Reciproc R25 instruments. The teeth were randomly assigned to four groups according to the irrigation protocol used ($n = 10$): Root canals in the two sequential chelation groups were irrigated with plain sodium hypochlorite (2% NaOCl) during instrumentation. Subsequently, 17% EDTA was administered (2.5mL), either with a slim tip (Endo-top) or with additional ultrasonic activation (Irrisafe Ultrasonic Tip 20/25mm, 30s, 35% power). In the continuous chelation groups, root canals were irrigated using a fresh mixture of 2% NaOCl containing 9% Dual Rinse HEDP during and after instrumentation. Again, in one of these groups the final irrigant (2.5mL) was applied just with the irrigating tip, in the other group it was ultrasonically activated. Obturation in all groups was performed with Ceraseal sealer mixed with Fluo-3 dye and gutta-percha using the single cone technique. Samples were sectioned at 3 mm from the root apex and observed using confocal scanning laser microscopy to measure the sealer-per-dentin area. Data were analyzed using one-way ANOVA. The significance level was set at $p < 0.05$. Student's t-test was used to compare the penetration values of the two groups within ultrasonic activation or within needle irrigation.

Results No significant differences regarding sealer penetration were found between sequential and continuous irrigation protocols ($p > 0.05$). However, penetrability results were higher in the groups with ultrasonic activation compared to needle irrigation ($p < 0.05$).

Conclusions Ultrasonic activation EDTA and a combined NaOCl/HEDP irrigant enhances sealer penetration into dentinal tubules similarly.