Accuracy of 3D digital modeling of dental arches

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Objective: The aim of the study was to verify and compare the accuracy of full-arch digital impressions obtained using two intraoral scanners and three scanning methodologies.

Methods: A resin model created with dental 3-D printing was scanned by a reference scanner (Zfx Evolution - Zimmer Biomet, Palm Beach Gardens, FL) in order to obtain a 3D reference; the same resin model was then scanned with two different intraoral scanners (Zfx IntraScan and Carestream 3600 - CS 3600®, Carestream, Rochester, NY, USA) using: Technique A (from tooth #27 up to tooth #17); Technique B (from tooth #11 up to tooth #17 and then from tooth #21 up to tooth #27) and Technique C (from tooth #22 up to tooth #17, and then from tooth #12 up to tooth #27 — the MeshLab software v. 1.3.3 was then used to match the two scans). The scans obtained were superimposed over the reference scan by means of a software, and the volumetric discrepancies were calculated.

Results: The mean results for the Zfx Intrascan scanner were: Technique A = 302.47 ± 37.42 µm; Technique B = 180.45 ± 29.86 µm; Technique C = 147.34 ± 28.23 µm. The mean results for the Carestream 3600 scanner were: Technique A = 303.59 ± 40.20 µm; Technique B = 181.53 ± 29.61 µm; Technique C = 142.28 ± 35.33 µm. Technique C, used by both scanners, produced less volumetric discrepancies compared to the other techniques.

Conclusions: The scanning technique had a statistically significant effect on the quality of the scan ($p < 0.0001$), whereas the scanner did not present any significant influence ($p = 0.91$).

Keywords: Digital impression. Intraoral scanner. Scanning technique.

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