

Publication

Accuracy of Three-Dimensional Printed Templates for Guided Implant Placement Based on Matching a Surface Scan with CBCT

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BACKGROUND: Reference elements are necessary to transfer a virtual planning into reality for guided implant placement. New systems allow matching optical scans with three-dimensional radiographic images. **PURPOSE:** To test whether digitally designed three-dimensional printed templates (D-temp) fabricated by matching surface scans and cone beam computed tomography (CBCT) images differ from the templates fabricated in-lab (L-temp) by using a physical transfer device for the positioning of the guiding sleeves. **MATERIALS AND METHODS:** L-temp were fabricated for eight human lower cadaver-jaws applying a digital planning software program (smop, Swissmeda AG, Zurich, Switzerland) using a Lego(R) (Lego Group, KIRKBI A/S, Billund, Denmark) brick as reference element and the respective transfer device (X1-table). Additionally, digital templates (D-temp) using the identical planning data sets and software were virtually designed and three-dimensional printed, after matching a surface scan with CBCT data. The accuracy of both templates for each planning was evaluated determining the estimated coronal, apical, and angular deviation if templates were used for implant placement. **RESULTS:** Mean coronal deviations for L-temp were 0.31 mm (mesial/distal), 0.32 mm (lingual/buccal), and 0.16 mm and 0.23 mm for D-temp, respectively. The mean apical deviations for L-temp were 0.50 mm (mesial/distal), 0.50 mm (lingual/buccal). and 0.25 mm and 0.34 mm for the D-temp, respectively. Differences between both devices were statistically significant ($p > .05$). **CONCLUSIONS:** A higher accuracy of implant placement can be achieved by using three-dimensional printed templates produced by matching a surface scan and CBCT as compared with templates which use physical elements transferring the virtual planning into reality.

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