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Influence of Model Resins on 3D Printed Dental Models' Accuracy

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Objectives The advantage of open 3D printing systems is that the printer can not only use the material supplied by its manufacturer but is also compatible with materials from other companies. This study aimed to evaluate the influence of different model resin materials on the printing accuracy of an open-system 3D printer.

Methods A maxillary typodont model with partial edentulism and four prepared teeth (#17, #14, #11, #26) was chosen to generate a reference STL file. Sixteen half-ball markers were placed on the model as landmarks for the superimposition and point-based measurements. A hollow model was designed with a cross-arch plate base in 3Shape Model Builder software. The models were printed using an open system DLP printer Asiga Pro 4K80 with 50 µm layer thickness oriented with a 30-degree build angle. Four available model resin materials were selected: Asiga DentaMODEL Almond (AS), Dreve FotoDent Model2 (DR), Harzlabs Dental Model Gray (HL), and Pro3Dure Printodent GR13.1 (PD) (n=10). Models were post-processed according to the manufacturer's instructions. The models were scanned with a Vinyl Open Air desktop scanner and imported into Geomagic Control X software to assess the trueness and precision of the printed models. Whole deviation and linear measurements of distances between the reference points were used to determine the accuracy of the 3D printed models expressed in root mean square (RMS) values.

Results According to our preliminary results, measurements of the printed models demonstrated deviations from the reference model. Trueness results of whole deviation are the following (mean, min., max.): AS 219,3 µm (195,3; 239,9), DR 187,9 µm (163,4; 199,4), HL 164,8 (156,4; 180,2), PD 249,0 µm (186,0; 317,8).

Conclusions The type of model resin material can influence the printing accuracy of an open-system 3D printer, Asiga Pro 4K80.