Research & Table Clinic Day 2020 Structured Abstract

TITLE: Effect of Print Angulation on Surface Roughness of 3D-Printed Models

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TITLE:

Effect of Print Angulation on Surface Roughness of 3D-Printed Models

OBJECTIVES:

To measure/compare surface roughness of 3D-printed models made from the same STL file and fabricated using a variety of printer/resin types at different angulations.

METHODS:

3D-printed models were made from the same master STL file, using a variety of resins/printers at 0°, 30°, and 90° (vertical) to the build plate: FL Gray resin (FormLabs2), SR Gray Resin (MoonRay-S), SR Tan Model (MoonRay-S), Denta Model (UV Max, ASIGA), FotoDent Model (Planmeca-Creo), SprintRay Model (MoonRay-PRO), Polar-White PLA Filament (CelRobox), Verodent Mod 670 (Objet Eden 260VS). Six replications were made for each condition N=48. Individual models were positioned vertically in a custom jig and the facial surfaces of the upper left incisor (tooth #10) were optically scanned (ST400, Nanovea). Software (DigitalSurf, Taylor Hobson), was used to determine surface roughness (Sa (form removed) or Waviness (with form)) on the same area of each tooth. For both parameters, data were analyzed using 2-factor, repeated measures ANOVAs. Because of significant interaction terms, follow-up 1-factor, repeated measures analyses were performed within each resin/printer combination among angulations, followed by Tukey post-hoc tests, where appropriate. (pre-set alpha 0.05).

RESULTS:

Significant interactions $p<0.001$) between resin/printer and angulation prevented global interpretations for both parameters with respect to the primary factors. For Sa, 6/8 resin/printer combinations demonstrated a significant influence of angulation, with no general trends. For waviness, only 3/8 combinations presented a significant influence of angulation, with the 90° (vertical) angulation the highest in each case.

CONCLUSIONS:

Print angulation can significantly affect the surface roughness parameters of 3D printed objects, but the results seem to be product (resin/printer) and angle-specific.

LEARNING OBJECTIVES:

1. State the differences between object waviness and roughness (Sa), and how these factors are important to apply to 3D materials.
2. State the effect of print angulation on product waviness and roughness among different types of 3D printers and resins.
3. State the clinical implications of item waviness and roughness.