

22105 | Internal Fit of 3D Printed occlusal splints: impact of build orientation

Sarah Araújo¹; Lara F. Barbosa²; Anselmo A. Simionato¹; Bruna N. Freitas¹; M. Helena Figueiral²;

Ana P. Macedo¹; Manuel A. Sampaio-Fernandes²

Department of Dental Materials and Prosthodontics FAPESP 2023/05068-4, Faculdade de Odontologia de Ribeirão Preto, Universidade de São Paulo, São Paulo, Brazil¹; Department of Prosthodontics, Faculdade de Medicina Dentária, Universidade do Porto, Oporto, Portugal²;

Background & Aim: In dentistry, occlusal splints are devices commonly used to treat or relieve the symptoms of temporomandibular disorders and bruxism. [1,2] The internal fit of occlusal splints is an essential condition that directly affect longevity and therapeutic success. [2] With the advancement of CAD/CAM technology, these devices have been manufactured using additive manufacturing such as three-dimensional (3D) printers. [3] However, scientific information about build orientation is scarce. [3] Thus, the objective of this study was to evaluate the internal fit of 3D printed occlusal splints manufactured with different orientations.

Methods: An occlusal splint was designed using CAD software (Exocad GmbH, Darmstadt, Germany) and exported as standard tessellation language (STL) file. From this digital model, thirty occlusal splints were manufactured with a resin (cosmos splint, Yler) using a 3D printer, with three different build orientation: 0°, 45° and 70° (n=10). The three groups were scanned using an extraoral scanning system (Identica T500, Medit). All best-fit superimpositions were conducted between the digital model and the occlusal splints obtained (figure 1). A $P < .05$ level was considered significant. **Results:** The internal fit values - measured as the root mean square (RMS) found in this study are in accordance with those found in the literature, although no statistically significant differences were found between the different build orientations evaluated. **Conclusions:** Additive manufacturing such as 3D printers is a valid technique to produce occlusal splints. Although build orientation did not affect internal fit, further studies with different resins and orientation angulations are mandatory.

Keywords: Additive Manufacturing, Internal Fit, Occlusal Splints, Three-Dimensional Printing,

References:

[1] Hardy RS, Bonsor SJ. The efficacy of occlusal splints in the treatment of bruxism: A systematic review. J Dent. 2021;108:103621.

[2] de Paula Lopez V, Dias Corpa Tardelli J, Botelho AL, Marcondes Agnelli JA, Cândido Dos Reis A. Mechanical performance of 3-dimensionally printed resins compared with conventional and milled resins for the manufacture of occlusal devices: A systematic review. *J Prosthet Dent*. 2023 Jan 9:S0022-3913(22)00766-1.

[3] Cameron AB, Tong K, Tadakamadla S, Evans JL, Abuzar M. Effect of build orientation on the trueness of occlusal splints fabricated by three-dimensional printing. *J Oral Sci*. 2023 Oct 1;65(4):261-264.

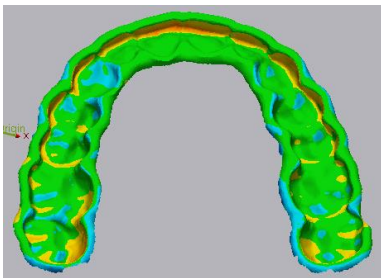


Figure 1: Color deviation map between digital model and a 3D printed occlusal splint