Evaluation of Trueness of 3D-Printed Custom Open Trays for Single Implant Impressions

Materials and Methods: A fabricated model, featuring an implant of the left lower molar tooth, was used in this study. An impression coping from the same manufacturer was attached to the implant and scanned by using high-accuracy industrial scanner (Atos Core 80) to obtain a reference scan. For first group, eight conventional custom open trays were fabricated using a light-cured base plate (Arasta Lc) with a 2 mm layer of wax (Great Dental Wax) applied to the model. For second group, eight custom open trays were produced through a 3D printer (Primeprint, Dentsply Sirona) through a dental design program (InLab SW, Dentsply Sirona). A total of 16 impressions were taken from the models in which impression copings were placed by using additional silicone impression material (Elite HD+, Zhermack SpA). Afterwards, the analogues were placed in the impression and plaster models were obtained. All of the models were scanned with a laboratory scanner (InEos X5, Dentsply Sirona). The digitally obtained STL (D-STL) data and conventionally obtained STL (C-STL) data were evaluated as two separate groups. Trueness values were obtained by measuring the deviation of each group from the reference model. Independent t test was used to compare results between two tested groups. (α=.05)

Results: Compared to the reference model, the D-STL group (43.25 ± 8.18) demonstrated a statistically significant closer proximity to the reference model than the C-STL group (67.75 ± 8.54). (p<.001)

Conclusion: Within the limitations of this study, the findings suggest that 3D-printed custom open trays have promising accuracy for single implant impressions. Further research is warranted to validate these results and explore the potential benefits of utilizing this technology in clinical practice.

Keywords: 3D printing, dental impression, implant dentistry, accuracy, impression tray