Modular Reusable 3D-printed Mounts Preserving Facebow Information

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Objective

To present a technique for transferring facebow information from the digital environment to 3D-printed models via an attachment with known position relative to modular reusable 3D-printed mounts.

Methods

Upper and lower stone mounting references with fiduciary markers to aid alignment were created on mounting plates. The upper and lower mounting references were scanned using a Media T710 desktop scanner (Medit Corp., Seoul, South Korea) the underside of each mounting reference was also scanned to capture the mounting plate. The mounting references were then scanned on a Denar Mark 330 articulator (Whip Mix Corp., Louisville, KY, USA) to capture their relationship to each other and their position within the articulator.

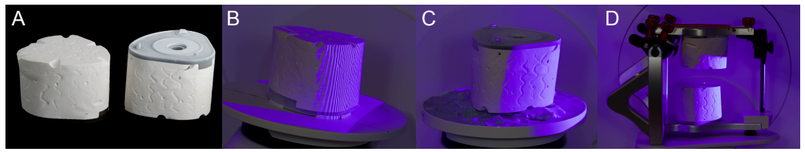


Figure 1: (A) Mounting references, (B) Scanning mounting reference, (C) Additional scan capturing mounting plate, (D) Scanning relationship of mounting references and position in the articulator

The additional scans with the mounting plate captured were aligned to each reference in the dentalCAD software (ExoCAD GmbH, Darmstadt, Germany) such that the mounting references were digitized with information on all sides captured.

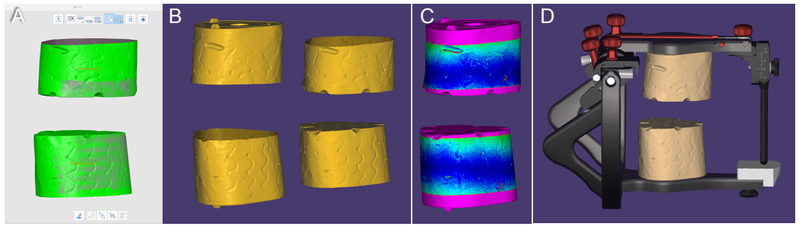


Figure 2: (A) Mounting references aligned in the scanning software, (B) additional mounting plate scans prepared for alignment, (C) alignment of additional scans, (D) fully digitized mounting references positioned in articulator

The digitized objects were transferred to Fusion 360 (Autodesk Inc., San Rafael, CA, USA) preserving their spacial relationship and coordinates. The mounting plates were isolated, and a mounting assembly was constructed atop the mounting plates. An additional component—the “base attachment”—was created and positioned relative to the mounting assembly, and holes were designed in both the mounting assembly and the base attachment such that the two pieces could be joined using standard dowel pins (Coltene Inc., Cuyahoga Falls, OH, USA; item PX117).

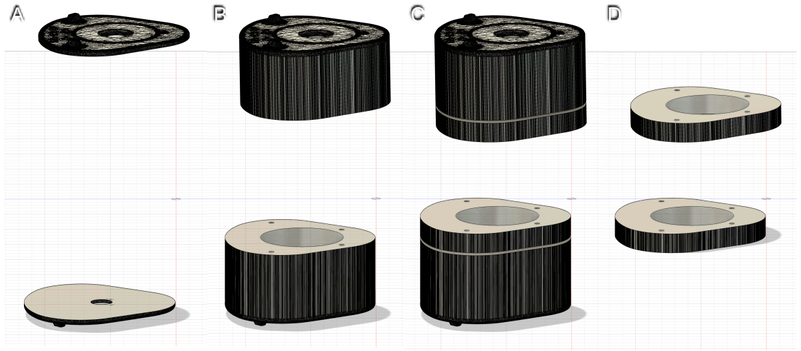


Figure 3: (A) Isolated mounting plates, (B) Mounting assembly, (C) Mounting assembly with base attachments, (D) base attachments

Watertight models were digitized with their facebow information, and imported into the dentalCAD software, where the base attachments were added to the watertight models.

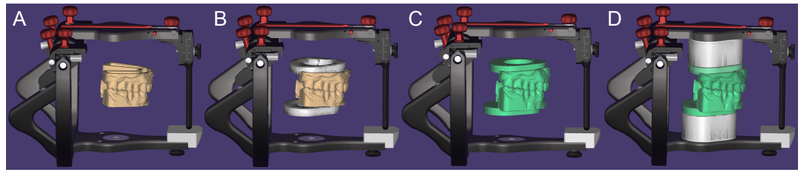


Figure 4: (A) Models positioned according to facebow information, (B) Visualization of base attachment positioned relative to models, (C) Models with base attachment merged, (D) Visualization of entire assembly

The mounting assemblies and models with base attachments were 3D-printed using a Phrozen Sonic Mighty 8K (Phrozen Tech., Hsinchu, Taiwan) LCD 3D-printer at 30° angulation. A ferromagnetic washer was added to each mounting assembly to couple with the articulator magnet. Finally, each model was attached to its mount, resulting in 3D printed cross mounted models with facebow information preserved.

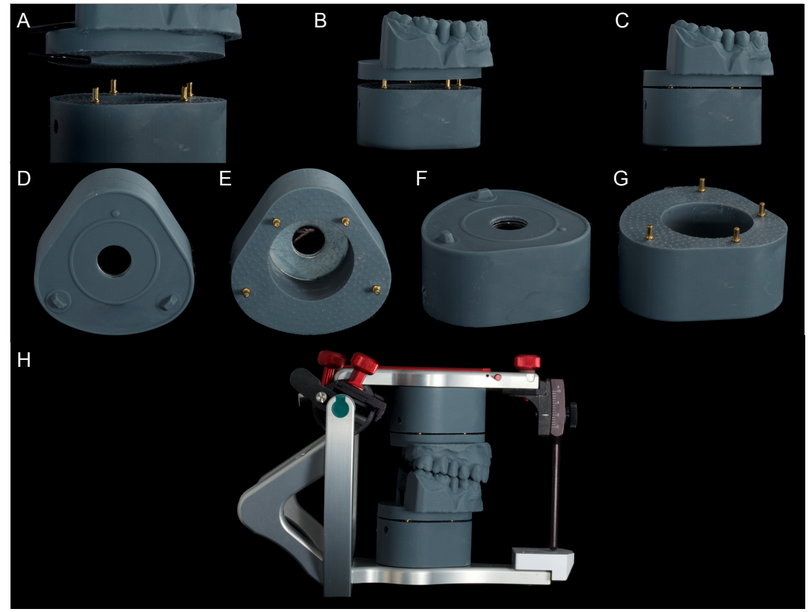


Figure 5: (A, B, C) Coupling of model with base attachment to mounting assembly, (D, E, F, G) Mounting assembly including incorporated mounting plate, dowel pins and ferromagnetic washer

Conclusion

3D-printed models were fitted onto reusable 3D-printed mounts such that facebow information was preserved. This method minimizes printing time, material cost, and storage space due to the reusable mount.

References

Yang, S., Wu, L., Alabkaa, B., Yuan, Q., Yue, L., & Li, J. (2024). Digital cross-mounting of intraoral scan casts from a virtual articulator to a mechanical articulator by using a custom transfer plate: A dental technique. The Journal of prosthetic dentistry, S0022-3913(24)00205-1. Advance online publication. https://doi.org/10.1016/j.prosdent.2024.03.012