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Printers Affect the Dimensional Stability of Casts in Biodegradable Resins

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Objectives To evaluate the effect of 3D printer on the dimensional stability of printed casts in different biobased resins by comparing to that of casts in dental model resin.

Methods STL file of a dentate maxillary model (R-STL) was used to fabricate diagnostic casts in a dental model resin (KM), a soy-based model resin (SB), and a corn-based model resin (CB). The casts were printed either with a DLP or an LCD 3D printer (n=10). Each cast was digitized with a laboratory scanner the day after fabrication, and once every week for the next 4 weeks to generate C-STLs. C-STLs were superimposed over the R-STL and RMS values were automatically calculated for different regions (anterior, posterior, entire arch, soft tissue, and entire cast). Generalized linear model analysis was used to evaluate data within each region ($\alpha=.05$).

Results Dimensional stability of the casts was affected by the model resin, printer, and the interaction between these factors ($P\leq.004$). DLP printer mostly led to lower RMS ($P<.001$). KM had the highest RMS in the anterior when DLP and in the posterior when LCD printer was used ($P\leq.047$). In addition, it had the lowest RMS in the anterior when DLP printer was used ($P<.001$). SB had the highest RMS in the anterior when LCD printer was used ($P<.001$), whereas it had the lowest RMS in the anterior and soft tissue when DLP printer and in the soft tissue and entire cast when LCD printer was used ($P<.001$). CB had the highest RMS in regions other than the anterior when DLP was used, and had the lowest RMS in the entire arch when LCD was used ($P\leq.008$).

Conclusions Maxillary diagnostic casts fabricated by using tested soy-based resin and DLP printer may be more reliable to replicate the intraoral situation compared with other resin-printer pairs tested. Dimensional stability of tested casts did not change over the course of one month.