Three dimensional evaluation of the holographic projection in digital dental model superimposition using HoloLens device

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Abstract

Objective
To assess validity and reliability of palatal superimposition of holograms of 3D digital dental models using a customized software, (Ortho Mechanics Sequential Analyzer OMSA), installed on Microsoft HoloLens device as compared to the OMSA application running on a regular computer screen.

Methods
The sample consisted of pre and post treatment digital maxillary dental models of 20 orthodontic cases (12.3 Ñ 1.9 years) treated by rapid maxillary expansion (two turns per day). For each case, the pre and post treatment digital models were superimposed using hand gestures for marking the dental models holograms in mixed reality using the Microsoft HoloLens. The same models were then superimposed using the conventional landmark based method with OMSA software running on a regular computer screen. The same set of dental arch parameters was measured on the superimposed 3D data by the two software versions for comparison. Agreement in the superimposition outcomes among the two superimposition methods was assessed using Dahlberg error (DE), concordance correlation coefficients (CCCs) using two way ANOVA mixed model for absolute agreement and Bland Altman analysis.

Results
Repeatability was acceptable for all variables based on the high values of CCCs over 0.99 with a lower 95% confidence limit over 0.95 for any variable. The DE ranged from 0.14 mm to 0.36 mm. The absolute error did not exceed 0.5 mm for any variable.

Conclusion
Using the depth vision capabilities of the Microsoft HoloLens, 3D digital dental models can be reliably superimposed allowing virtual assessment of orthodontic treatment outcomes.

Orthod Craniofac Res 2019, May