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THREE DIMENSIONAL EVALUATION OF THE HOLOGRAPHIC PROJECTION IN DIGITAL DENTAL MODELS SUPERIMPOSITION USING HOLOLENS DEVICE

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Summary: Objective: The aim of this study was to assess validity and reliability of 3D palatal superimposition of holograms of 3D digital dental models using a customized software (Ortho Mechanics Sequential Analyzer OMSA) installed on Microsoft Hololens device1-3, compared to the conventional OMSA application running on a regular computer screen. The OMSA software is developed to enable orthodontists to superimpose pre and post treatment digital dental models by selecting specific registration points selected by the user on stable anatomical landmarks. Then the orthodontist shall be able to analyze the achieved orthodontic tooth movement from the superimposed pre and post treatment 3D digital dental models. Methods: The sample consisted of pre- and post-treatment digital maxillary dental models of 20 orthodontic cases treated by maxillary expansion. 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 (Figure 1). Then the same models were superimposed using the conventional landmark based method using OMSA software running on a regular computer 2 D 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 evaluated with Dahlberg error (DE), intra class correlation coefficients (ICCs) using two way ANOVA mixed model for absolute agreement and Bland-Altman agreement limits (LOA). Results: Repeatability was acceptable for all variables based on the high obtained values of ICCs over 0.99 with a lower 95 % confidence limit over 0.95 for any variable. Also, the Dahlberg error (DE) ranged from as low as 0.14 mm up to 0.36 mm. The absolute error did not exceed 0.5 mm for any variable. Conclusions: Using the depth vision capabilities of the Microsoft HoloLens, 3D digital maxillary dental models can be visualized, get landmarks selected by stereovision and can be superimposed to interactively assess 3D orthodontic treatment outcomes.

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