HO03 A NOVEL METHOD FOR SUPERIMPOSITION AND MEASUREMENTS ON MAXILLARY DIGITAL THREE-DIMENSIONAL MODELS – STUDIES ON VALIDITY AND RELIABILITY

Niels Ganzer[1,2], Ingalill Feldmann[1,2], Per Liv[2], Lars Bondemark[3], [1]Department of Orthodontics, Public Dental Service Region Gävleborg, Gävle, and [2]Centre for Research and Development, Uppsala University/Region Gävleborg, Gävle and [3]Department of Orthodontics, Faculty of Odontology, Malmö University, Sweden

AIMS: Treatment effects or changes during retention can be analysed using serial three-dimensional (3D) study models. But, 3D study models need to be superimposed correctly before measurements can be assessed and earlier studies have shown that literally every anatomical structure in the palate could change due to growth or treatment. A new method for superimposition and measurement of maxillary 3D models that compensates for morphological changes has been developed. Changes are detected by deformation analysis. This analysis is based on an algorithm that identifies areas of deformation and therefore, in a second step, only unchanged areas are used for superimposition. The purpose of this study was to investigate the validity and reliability of a novel method for superimposition and measurement of serial 3D models.

MATERIALS AND METHOD: After sample size calculation 3D models from 16 patients were derived from an on-going study on anchorage. These 16 3D models were modified to simulate space closure and growth by an independent 3D engineer. Thus, true values for tooth movements on each model could be used as a reference. Four senior consultant orthodontists performed the measurements. Repeated measurements were carried out after at least two weeks. Statistical analysis was performed with linear mixed models using R.

RESULTS: Translational measurements had a mean error of 0.000851 mm (SD 0.03 mm). The range of the measurement error was 0.15 mm. The intraclass correlation coefficient (ICC) was 0.9996. Rotation measurements had a mean error of 0.024 degrees (SD 0043°), a range of 0.46 degrees and an ICC of 0.9999.

CONCLUSION: The tested method is a valid and reliable tool for measuring tooth movements in the maxilla. The method produces results with excellent accuracy and precision even when changes through growth or orthodontic treatment occur.