

Comparison of fully automated and manual integration of CBCT and intraoral scans in patients with and without metal artefacts

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Introduction. Integrated Cone-Beam Computed Tomography (CBCT) and intraoral scans (IOS) are essential for treatment planning orthognathic surgery cases. Technological advances have enabled the automatic integration of dental scans and CBCT images, however, the presence of metal artefacts does reduce the precision of this procedure.

Materials and methods. CBCT and IOS data were collected from 30 patients two weeks after surgery and one-year post-surgery. The immediate post-surgery scans included fixed appliances (FA), whereas the scans obtained one year later did not (no-FA). Automatic integration was performed using Romexis software, and manual integration was done using Dolphin Imaging. The accuracy of the integration was assessed by measuring MAD (mean absolute distance) between six anatomical point on each jaw of the CBCT and IOS. The measurements were performed with Slicer 3D software. Intra-class correlation (ICC) was calculated for point placement and reproducibility of integrations.

Results. All ICC values exceeded 0.90. The MAD values for the upper jaw were 0.51 and 0.53 for the FA group, 0.40 and 0.47 for the no-FA group, for Dolphin Imaging and Romexis, respectively. For the lower jaw the respective values were 0.39 and 0.50 for the FA group and 0.32 and 0.43 for the no-FA one. There was a statistically significant difference ($p < 0.05$) for the integration result for both jaws in the no-FA group, as well as for the lower jaw in the FA group.

Conclusion. Despite manual integration appearing to be superior for the no-FA group, both approaches precision wise fall below the clinical significance limit (0.5 mm). When integrating models with FA a manual approach is recommended for superior precision.