**0174 Superimposition of 3D Cone-beam CT Models of Orthognathic Surgery Patients**

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Objectives: To evaluate a new system to register 3D models constructed from cone-beam CT images taken before and after orthognathic surgery, assessing mandibular anatomy and position. Methods: Cone-beam CT scans were taken before and after orthognathic surgery for 10 patients undergoing maxillary surgery only. 3D models were constructed from the CT images utilizing semi-automatic segmentation and manual editing. A novel superimposition method utilized the surface of the cranial base to register 3D models of pre- and immediately post-surgery scans (1 week). A new tool was used for graphical overlay and 3D display to visually assess the location and magnitude of the variability between superimposed models. 3D color maps of mandibular rami surface distances between pre- and post-surgery models were created. One set of images was measured independently by three observers. The validity of the method was assessed using the hypothesis that mandibular structures remain unchanged after maxillary surgery. Results: 3D changes in mandibular rami position after surgical procedures were clearly illustrated by the 3D color maps. The average displacement of all surfaces was 0.77mm (SD=0.17mm), at the posterior border 0.78mm (SD= 0.25mm), and at the condyle 0.70mm (SD= 0.07mm). These displacements were close to the image spatial resolution of 0.60mm. The average interobserver differences were negligible, probably due to the use of semi-automatic methods. The range of the interobserver errors for the average of all mandibular rami surface distances was 0.02mm (SD=0.01mm). Conclusion: Our results suggest this method provides a valid and reproducible assessment of craniofacial structures for patients undergoing orthognathic surgery. This technique may be used to identify different patterns of rami and condylar remodeling following orthognathic surgery. (Supported by NIDCR DE-05215).

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Back to the Diagnostic Systems Program
Back to the IADR/AADR/CADR 83rd General Session (March 9-12, 2005)

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