Surface Laser Scanning of the Cleft Palate Deformity —Validation of the Method

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Abstract

   Innovations in laser technology have led to the development of three-dimensional surface laser digitisation techniques capable of registering surface topology accurately. The clinical application of this technology in cleft palate documentation requires validation of the technique. This study determined the reliability of the surface laser scanning technique and assessed the reliability of interactive three-dimensional landmark localisation. Original and duplicate plaster models of an infant with a complete unilateral cleft lip and palate were digitised with the Cyberware 3030R-HIREZ surface laser scanner. Seven anatomic landmarks were marked permanently on the palatal surface of the duplicate model only, which acted as visual cues for landmark localisation. Each model was scanned ten times serially, and ten composite three-dimensional images were obtained for each. On-line interactive computer landmark localisation permitted the assessment of variance for the x, y and z coordinates of each landmark. The precision of the laser scanning technique was found to be less than 0.06 mm in all three axes. Anatomic landmarks with the clearest visual cue were the least variable after ten rounds of scanning. Significant differences existed between visually aided and non-aided landmark localisation (P <0.05). While landmarks could be localised repeatedly without the aid of a visual marker, landmarks well defined by a clearly visible visual cue on the three-dimensional image were more reliable.

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   Key words: Cartesian coordinate, Landmark localisation, Reliability, Surface characterisation, Three-dimensional measurement

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