

CBCT Aided Pre-Assessment of Mandibular and Maxillary Bone Quality for Dental Implants

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Dental implants play a major role in permanent tooth replacement. Cone Beam Computed Tomography (CBCT) can be used to acquire detailed volumetric image data of the maxillofacial region for diagnostic and pre-surgical planning of dental implants. The purpose of this study was to design and evaluate a decision-making algorithm to quantitatively assess the alveolar bone density of the maxilla and mandible as a pre-implant assessment. CBCT images with edentulous maxillary and mandibular bone areas of 50 patients who have undergone CBCT scans in the University Dental Hospital, Peradeniya were selected. Those CBCT images were imported to the developed algorithm to calculate the Hounsfield values (HU) derived from Grey Values (GV) and categorized into types of alveolar bone density as stated in the Misch bone density classification. Moreover, same set of images were independently analyzed by two experts, and a manual assessment was performed on alveolar bone density according to Misch classification. The algorithm was more effective at locating the edentulous bone areas selected by the examiner and analyzing the bone density. Both experts were biased only on 40 cases with each other (80%) out of 50 cases. The correlation between CBCT, GV and CT numbers should be calculated when converting GV into HU. Even in our study, it was assumed that there is a linear relationship regardless of the kV due to the shortfall of proper calibration in the CBCT machine. Besides the two-expert biased optical assessment and lack of proper calibration of CBCT machine, the algorithm was competent to achieve overall reliability of 77.5% following the comparison of manual and algorithm assessed results.

Keywords: Cone beam computed tomography, Dental implants, Hounsfield units, Grey value, Bone density