Dental Cone-Beam Computed Tomography Evaluations of Alveolar Bone Density Around The Teeth During Orthodontic Treatment: A Follow-Up Case Study

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ABSTRACT

The objective of this study was to evaluate alveolar bone density changes around the teeth during orthodontic treatment by using dental cone-beam computed tomography (CBCT). Dental CBCT(i-CAT scanner, Imaging Sciences International, Hatfield, USA) was used to measure the alveolar bone densities around the six teeth (both maxilla central incisors, lateral incisors, and canines) in a 23 years old male, who received orthodontic treatment, for three times: (1) before orthodontic treatment; (2) after 7 months of orthodontic treatment (immediately scanned after the brackets and archwire were removed); (3) after 6 months for wearing orthodontic retainer (immediately scanned after the retainer were removed). CBCT images were taken with the following parameters: 120 kVp, 47 mA, 0.25 mm voxel resolution, and 16-cm field of view. The CBCT images were loaded into medical imaging software (Mimics 15.0, Materialise, Leuven, Belgium) to measure the alveolar bone density around the teeth. In this study, the bone density is represented in grayscale value. The changes in alveolar bone density around the measured teeth before and after orthodontic treatment were investigated. The ethical issues of the research protocol were approved by the institutional research board of China Medical University and Medical Center. The experimental results indicated that, compare first and second CBCT scanning, the reduction in bone density around the measured teeth was 20.7% after 7 months orthodontic treatment. However, compare second and third CBCT scanning, the bone density around the measured teeth was increased 23.2%. Though the bone density around the teeth reduced significantly after the application of orthodontic forces for 7 months. The bone density around the teeth can increase back to the original value. In this pilot study, the CBCT is useful for evaluating alveolar bone density changes around the teeth during orthodontic treatment. However, more sample size is needed in the future study to confirm the finding of this study.

Keyword: Dental cone-beam computed tomography, Orthodontic treatment, alveolar bone density