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Endodontic Treatment of Mandibular Incisors with Periapical Lesion by Using Single Instrument: Cone–Beam Computed Tomography Imaging

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Abstract

To demonstrate endodontic treatment of lesioned mandibular anterior teeth using single endodontic instrument.

Initial tomographic scans were obtained from the four patients who had no immune and chronic disease. Endodontic treatments were perform using single endodontic instrument with reciprocating motion at single visit. Six month after treatment, the final tomographic scans were obtained.

After treatments, the destructed areas were shown to be sufficient periapical healing. Besides, their bone densities were recorded in HUs. Quantitative differences between the initial and final values has emerged.

Key words: Endodontic treatment, Tomographic scans, Mandibular Incisors

Introduction

Dental pulp infections are the most frequently occured odontogenic pathologies in endodontics (1). The pulp infections commonly lead to pulpal necrosis is a suitable environment for bacteria to increase and release their toxins into periapical region, and bacterial infection can yield with periapical lesions and alveolar bone destructions (2). The ossification of destructed bone region might be provided by eliminating bacterial infection (3).

The goal of an endodontic treatment is to remove the microorganisms and biofilm and necrotic pulp tissues from the root canal system(4). Cleaning and shaping of the root canal system is one of the most critical step for bacterial reduction in endodontic treatment (5). Traditionally, the preparation of the root canal was performed by the use of stainless steel hand insturments (6). Rotary nickel-titanium files achieve this more effective and require less operation time (7). Thanks to superior elastic properties, nickel-titanium rotary files are supplied to facilitate curved root canals preparation (8). Conversaly, file separation is the most common procedural error that occurs during root canal preparation with rotary nickel titanium files caused by repeated use. Thus, the single use of endodontic instruments is predicted to reduce file separation and operation time (6).

The periapical radiograph is an essantial instrument for evaluating periapical tissues (9). It is known that periapical radiographs have limitations such as the two dimensionality, distortion and magnification of the anatomic structures. Cone-beam computed tomography (CBCT) has been manufactured to provide 3-dimensional images of the dentomaxillofacial complex (10). Moreover, CBCT supplies detailed

high-resolution images of oral structures and facilitate detection of bone lesions (11).

The purpose of this study was to evaluate healing periapical lesions before and after endodontic treatment using only one endodontic instrument.

Materials and Methods

The informed consent forms were obtained from adult patients before the study began. The patients were treated by same endodontist. The patients were in good health status (no diabetes mellitus, no carcinogenic disease, no immune disease) and did not use use of any drugs.

The trepanation cavity was opened by round bur and filled with 17% ethylenediaminetetraacetic acid (EDTA). After establishing apical patency, the root canals were instrumented mechanically with Reciproc® (VDW, Munich, Germany) using reciprocating motion under copious irrigation with 2.5% sodium hypochloride. Smear layer was removed by irrigating with NaOCl and EDTA. The root canals were obturated with with a Reciproc® gutta percha point, laterally condensed gutta-percha points, and a epoxy resin-based root canal sealer (AH plus;Dentsply DeTrey, Konstanz, Germany).

CBCT (I-Cat; Imaging Sciences International, Hatfield, PA) images were obtained at a setting of 120 kVp and 3-7 mA. All of the scans were scanned with a voxel size of 0.3 mm during 9 seconds exposure time.

The initial CBCT scans were acquired before endodontic treatment and the lowest bone density units were measured by HUs in these scans. The final CBCT scans were acquired 6 months after endodontic treatment with the same parameters.

Results

The images of four case were presented as follows.

Case 1

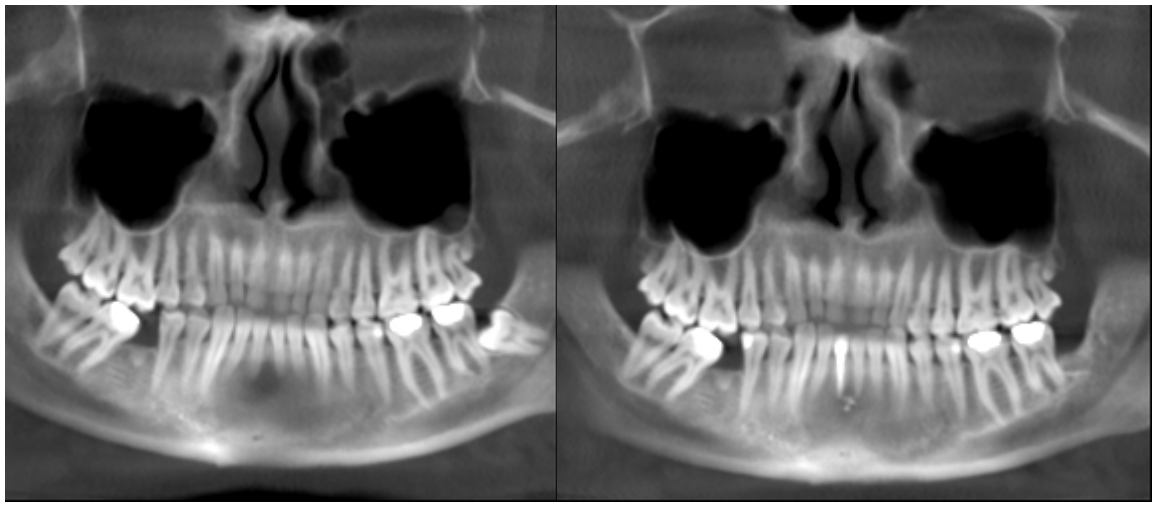

Figure 1: Initial and final panoramic images.

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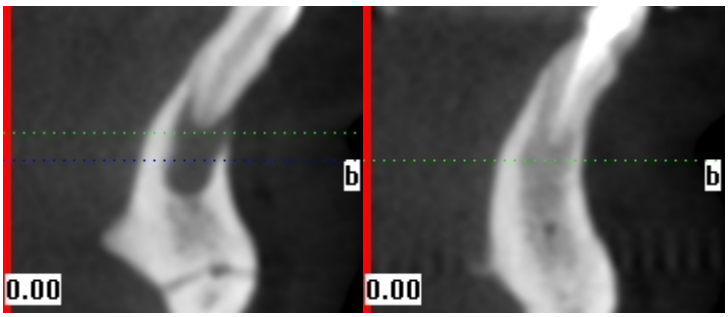

Figure 2: Sagittal image of healed bone.

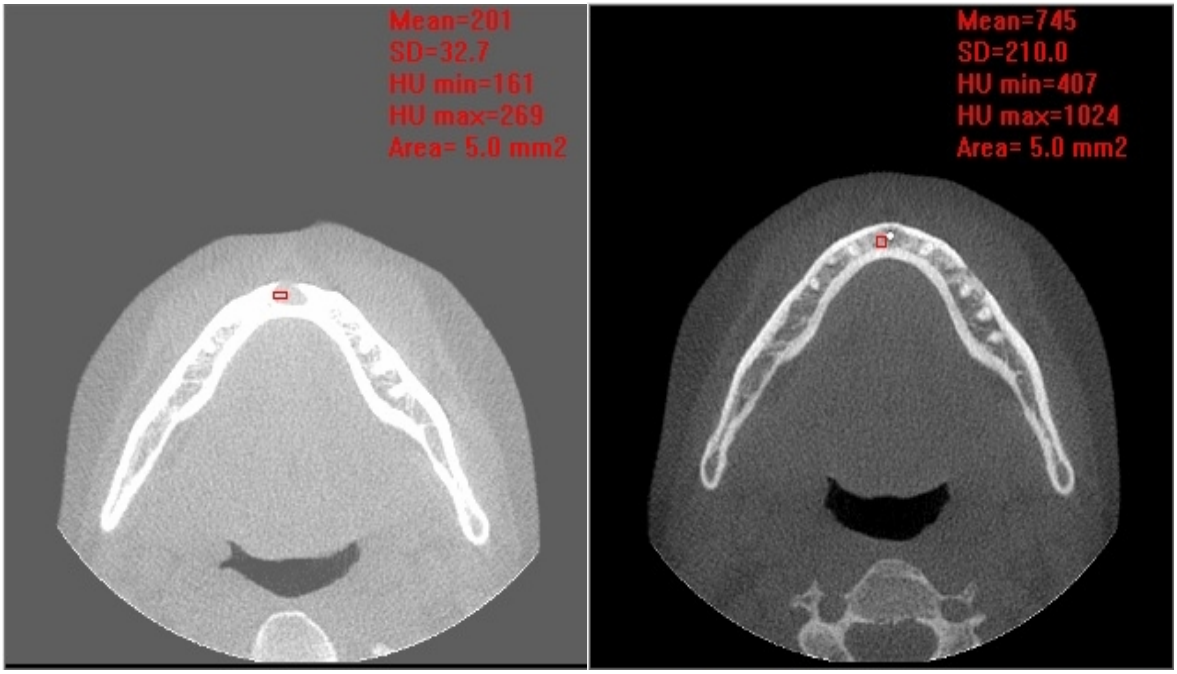

Figure 3: HU values of bone tissue healing 6 months after treatment.

Case 2

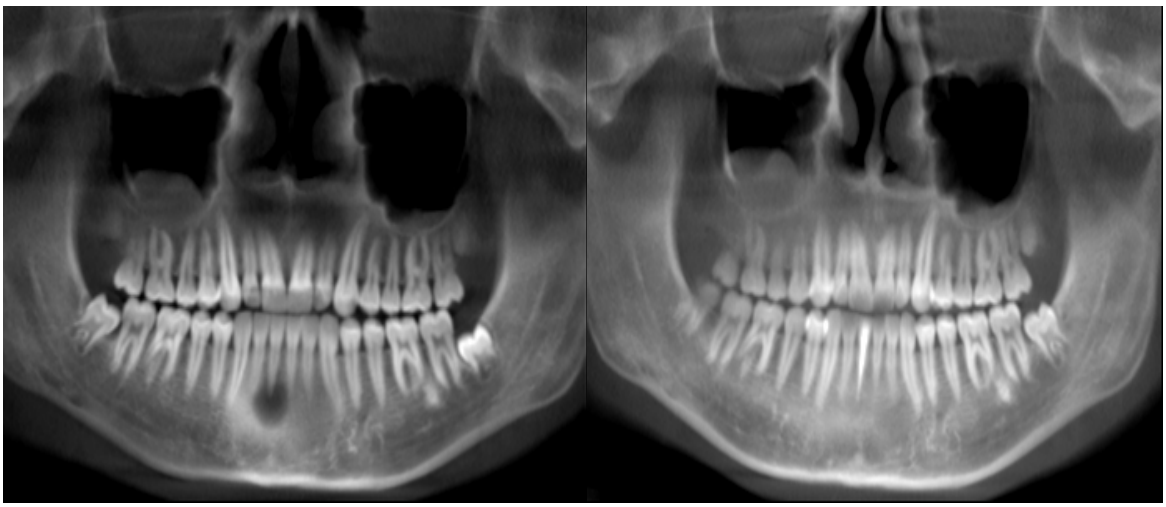

Figure 4: Initial and final panoramic images.

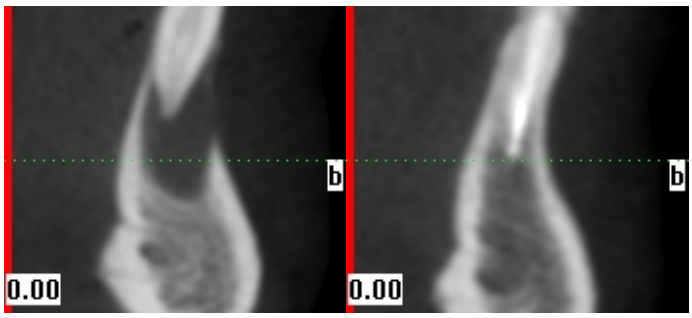

Figure 5: Sagittal image of healed bone.

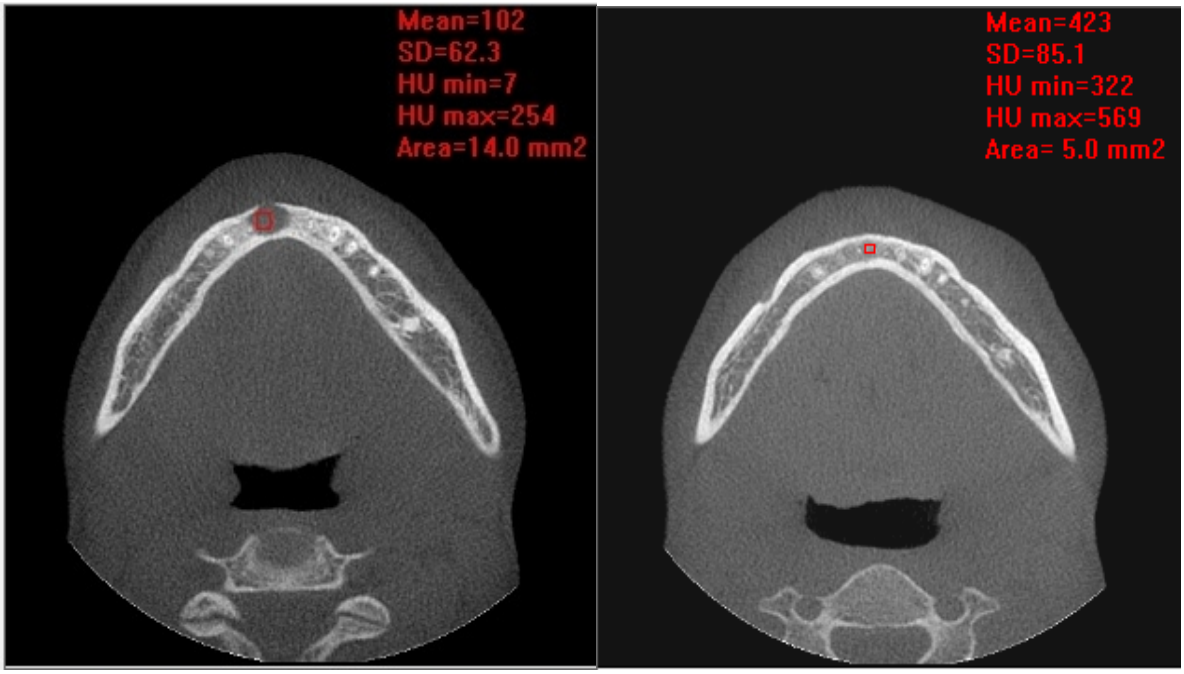

Figure 6: HU values of bone tissue healing 6 months after treatment.

Case 3

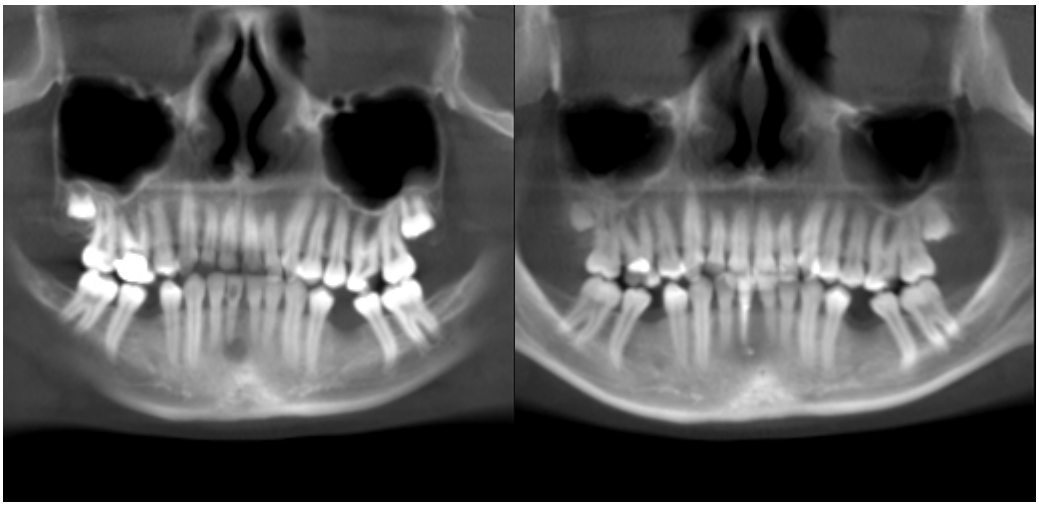

Figure 7: Initial and final panoramic images.

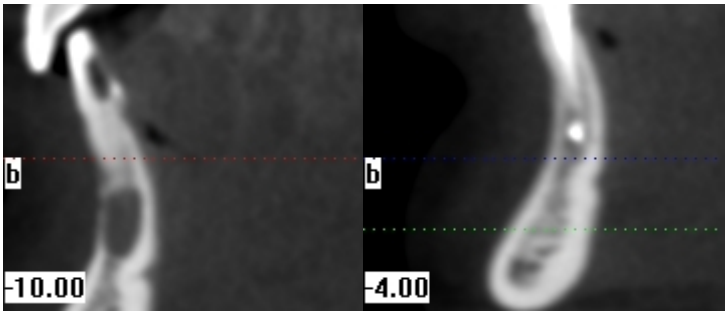

Figure 8: Sagittal image of healed bone.

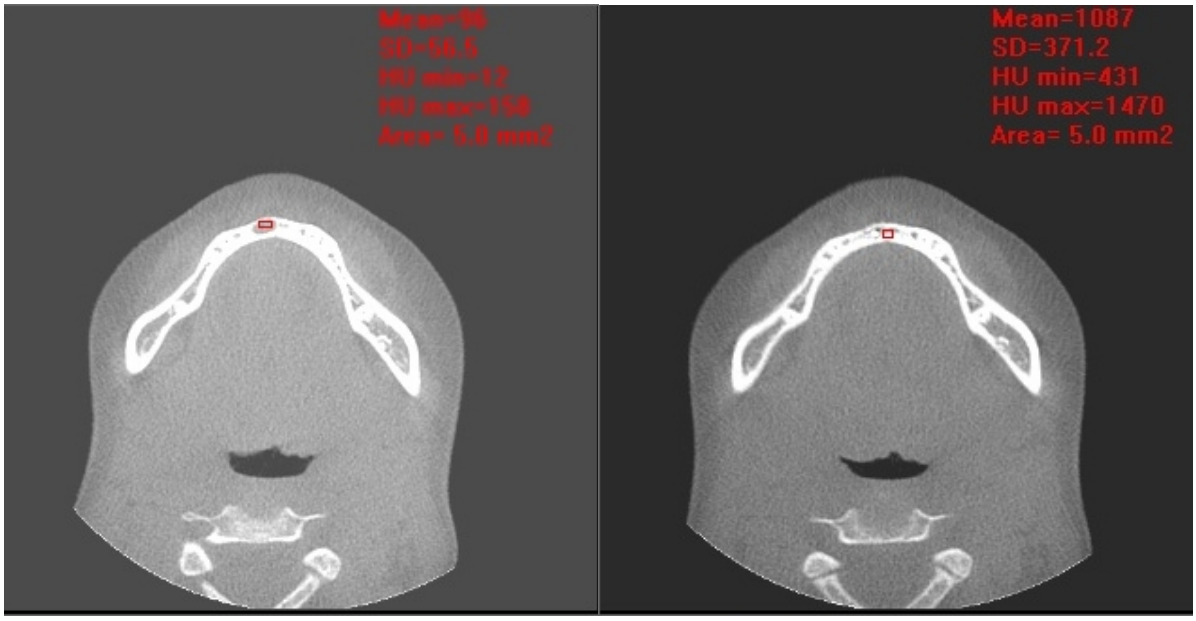

Figure 9: HU values of bone tissue healing 6 months after treatment.

Case 4

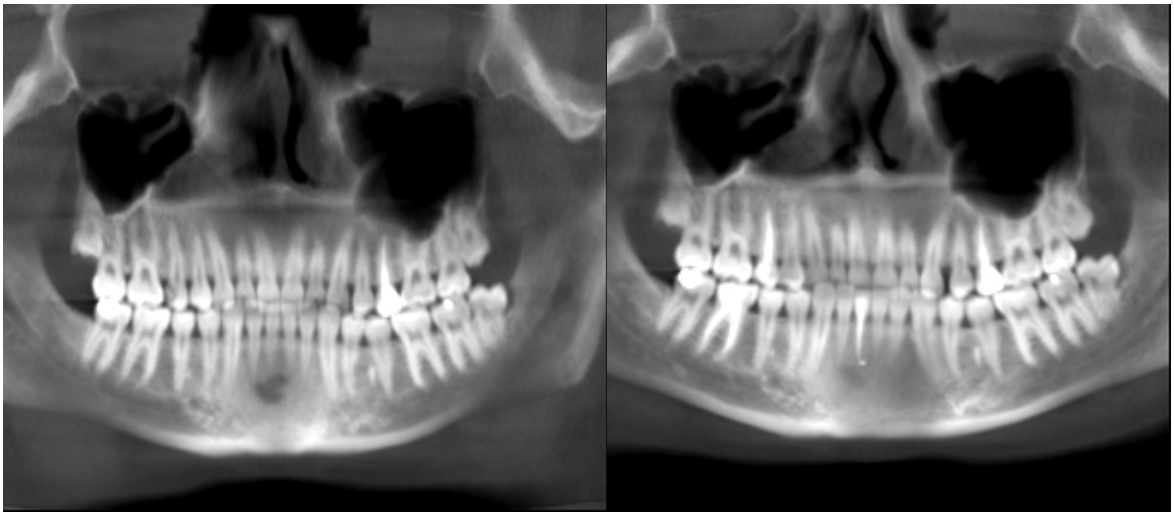

Figure 10: Initial and final panoramic images.

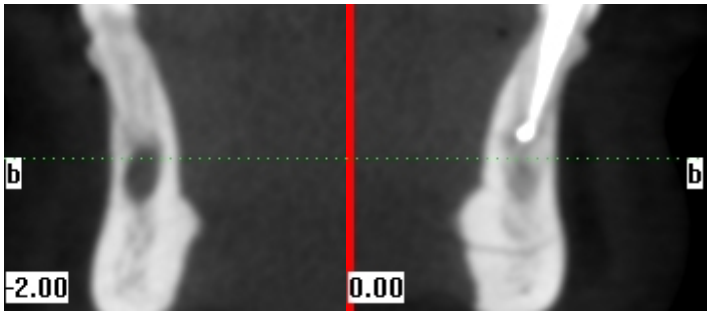

Figure 11: Sagittal image of healed bone.

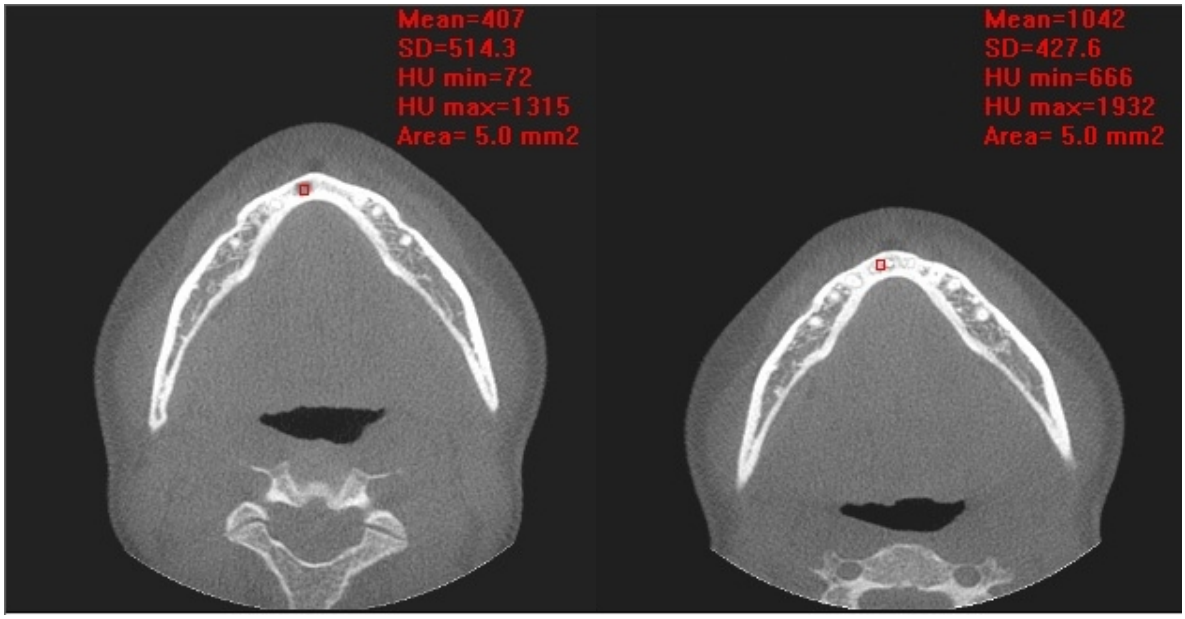

Figure 12: HU values of bone tissue healing 6 months after treatment.

The initial and final measurements were shown in Table 1. There are significant differences between initial and final values.

	Mean Initial	Mean Final	SD Initial	SD Final	HU min Initial	HU min Final	HU max Initial	HU max Final
Case 1	201	745	32.7	210	161	407	269	1024
Case 2	102	423	62.3	85.1	7	322	254	596
Case 3	96	1087	56.5	371.2	12	431	158	1470
Case 4	407	1042	514.3	427.6	72	666	1315	1932

Table 1: Result of HU measurements.

Discussion

CBCT is a useful device in endodontics (12). CBCT has been used to evaluate the healing of periapical lesions (13, 11). Thanks to Hounsfield Units(HUs) tool of CBCT, bone density can be measured quantitatively without the use of periapical index. The HU represents numeric information in each pixel of a conventionel CT image (14).

It has been shown that the canal treatment was performed at one session and the lower incisors with periapical lesions by single file system. The resulting completion CBCT scans post-treatment Periapical improvement of Hounsfield Units (HUs) has been determined as a result of the measurement. These results indicate that a single session of successful root canal is compatible with the previous study results (15-17). Measurements in order to ensure standardization 5 mm^2 have

been recorded in the field of measurement results.

Inflammation of the pulp and pulp necrosis resulting from bacterial endotoxin and lipopolisaccharites stimulate endodontic infection and the development and bone resorption (18-23). Martinho et al. (24) demonstrated that chemomechanical preparation with both rotary systems and single file reciprocating systems was able to eliminate endodoxins efficiently and there was no statistical differences between them.

Moreover, for single use which produced "single file reciprocating systems files" as a result of inadequate cleaning of instruments, depends to the lack of sterilization with the possibility of cross-contamination as a result via recurrent usage of metal fatigue connected any possible instrument fractures is decreased to be minimize (6).

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