Healing of a Large Periapical Lesion and Adjacent Cortical Bone: Cone-Beam CT Aided Diagnosis and Treatment

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Abstract: The primary aim of root canal treatment is the resolution of clinical symptoms and radiographic signs. Periapical lesion is a crucial problem resulting in the loss of teeth. The major reason of periapical lesion associated with infected pulpal tissue are caused by pulpal inflammation and/or degeneration through deep caries, trauma, or by a combination of these parameters. Periapical lesion in teeth with root canal treatment should be initially treated with nonsurgical retreatment procedures. Small volume Cone Beam CT can be a powerful tool in endodontic diagnosis, treatment planning and follow-up. This case report presents a complete clinical and radiological healing of a large periapical lesion and adjacent cortical bone of a hopeless tooth after retreatment procedures.

Keywords: Cone beam CT, healing, nonsurgical endodontic treatment, periapical lesion.

1. INTRODUCTION

The assessment of the outcome of endodontic treatment is based on comparative analysis of clinical and radiographic evaluation of the treated tooth at the time of treatment and follow up. The primary goals of root canal treatment are the resolution of clinical symptoms and radiographic signs. Clinical symptoms include spontaneous pain and/or pain to percussion, and palpation. Radiographic signs include widening periodontal ligament, loss of lamina dura and/or periapical lesion [1,2].

The major reason of periapical lesion associated with infected pulpal tissue are caused by pulpal inflammation and/or degeneration through deep caries, trauma, or by a combination of these parameters [3,4]. Consequently, the microbial aggregation or its products can infiltrate into periradicular tissues and stimulate the apical periodontium leading to resorption of the periapical bone structure and resulting in a radiolucency around root apex on the radiographs [4-6].

Failure of root canal treatment is generally attributed to inadequate treatment procedures or ineffective infection elimination [7,8]. Periapical lesion in teeth with root canal treatment should be initially treated with nonsurgical retreatment procedures. The aim of nonsurgical retreatment is to remove materials from the root canal space and if present, address deficiencies or repair defects that are pathologic or iatrogenic in origin [9]. The aim of this case report was to present a complete clinical and radiological healing of a hopeless tooth with a large periapical lesion after retreatment procedures.

2. CASE DESCRIPTION

A 25-year-old male patient was referred to endodontics clinic with pain during chewing on the right mandibular first molar tooth. The patient stated that root canal treatment was performed 7 years ago but one week ago, firstly the swelling occurred in the region and then, a fistula tract was observed. Intraoral examination confirmed presence of a fistula in the periapical area of the tooth. No mobility and percussion sensitivity were detected. Periapical radiograph revealed an inadequate root canal treatment and a large radiolucent lesion from the distal root apices to furcation region (Figure **1**). A gutta-percha cone (size

Figure 1: Periapical radiograph revealed a large radiolucent lesion from the distal root apices to furcation region.

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30) was placed into the fistula tract and a periapical radiograph was taken (Figure **2**). It revealed that the lesion originated from distal root. Since the patient did not prefer the extraction of the tooth, retreatment procedure was planned. To determine the morphology of the tooth and exact size of the lesion, small volume

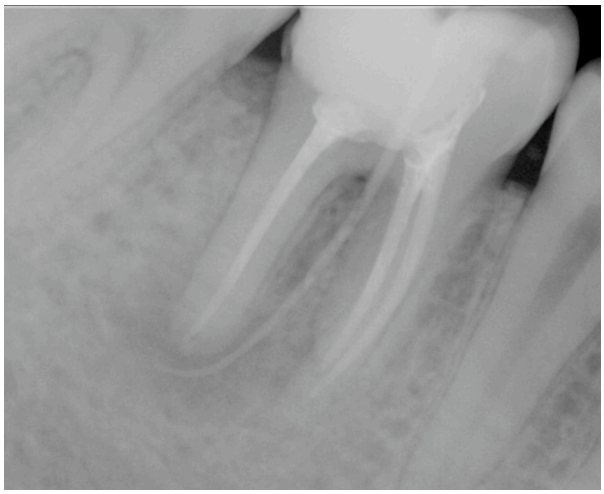

Figure 2: The placement of gutta-percha into the fistula (Gutta-percha showed distal root).

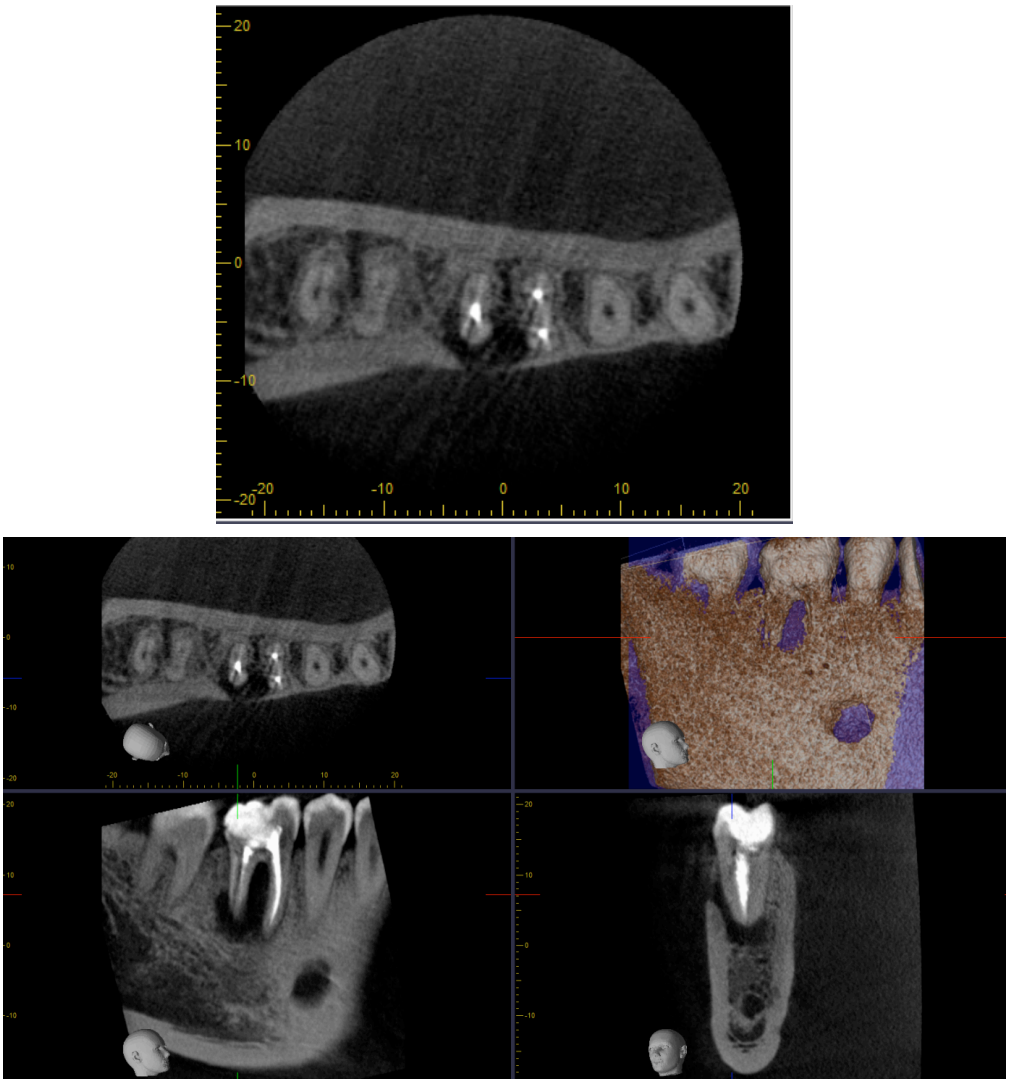

Figure 3(a): CBCT image showed a missed second canal in the distal root, a lesion and buccal bone resorption. (**b**): CBCT image showed origin, location, size, extent of lesion and a missed second canal in the distal root.

Cone Beam CT (CBCT) was taken. It showed a missed second canal and inadequate filling in the distal root and a large periapical lesion. In addition, buccal bone resorption was detected on CBCT image (Figures **3a** and **3b**). Since the mesial root canal treatment was adequate; only retreatment of the distal root canal was planned. After preparation of the access cavity (just only on the distal side of the crown), missed second canal in the distal root was detected (Figure **4**), previous root canal filling was removed from coronal third of the canal with Gates-Glidden drills (size 3, 2 and 1) and then, Mtwo R (VDW, Munich, Germany) file sizes 25/0.05 and 15/0.05 in a crown-down manner was used. Then, the working length was determined using an apex locator (Root ZX, J. Morita Inc., Japan). Cleaning and shaping of distal canals were performed using nickel-titanium (Ni-Ti) k-file, up to size 40 under copious irrigation with 2.5 mL of a 2% sodium hypochlorite solution (NaOCl). For removal of smear layer, the canals were irrigated with 2.5 mL 2% NaOCl for 60 sec, 2.5 mL 17% EDTA for 60 sec and 10 mL distilled water. Then calcium hydroxide medicament (Sultan Healthcare Inc., NJ, United States) was placed with a slight pressure into the distal canals and access cavity was sealed with temporary filling material (3M ESPE Cavit G). At this stage, calcium hydroxide was observed in the fistula. A week later, after removing of calcium hydroxide, final irrigation was performed with 5.25% NaOCl, 17% EDTA, distilled water and 2% chlorhexidine gluconate, respectively. Then, the canals were dried with paper points and obturated with AH Plus sealer (Dentsply DeTrey GmbH, Bensheim, Germany) and gutta-percha (Sure Dent Corporation, Korea) *via* the cold lateral compaction technique. Finally, the access cavity was sealed with amalgam (Figure **5**). At the eight months recall, the tooth was

Figure 4: Detection of missed canal with file.

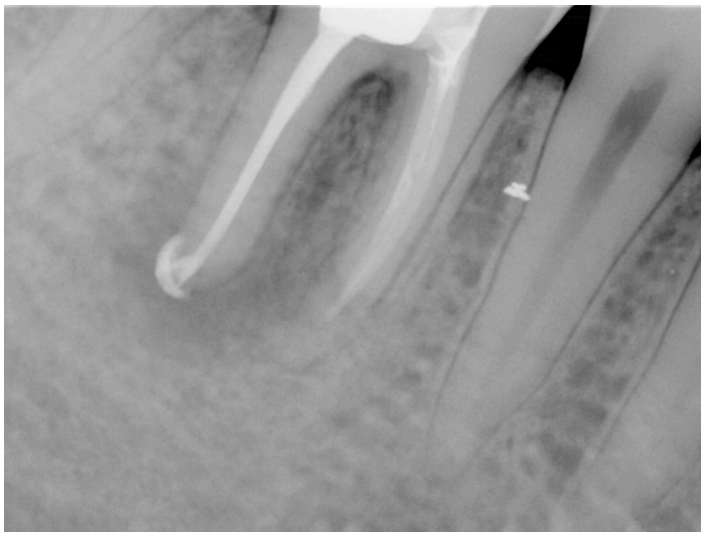

Figure 5: Post-op periapical radiograph after non surgical endodontic treatment.

Figure 6: Eight months after treatment, radiographic examination revealed a decrease in the size of the periapical radiolucency.

asymptomatic and healthy. Radiographic examination revealed a decrease in the size of the periapical radiolucency (Figure **6**). 15 months follow up; clinical and radiographic assessments showed almost complete healing. CBCT image also verified healing of periapical lesion and adjacent buccal bone (Figures **7a**, **7b** and **7c**). Then, the patient was referred to the department of prosthetic dentistry for porcelain-crown restoration. Twenty months later, clinical and radiological examination revealed that the tooth had no symptom and was healthy (Figure **8**).

3. DISCUSSION

Endodontic failures can be attributed to inadequate cleaning, shaping, obturation, missed canal, iatrogenic events or re-infection of root canal system. It has been shown that there is a strong relation between the presence of untreated root canals and periapical lesion [10,11].

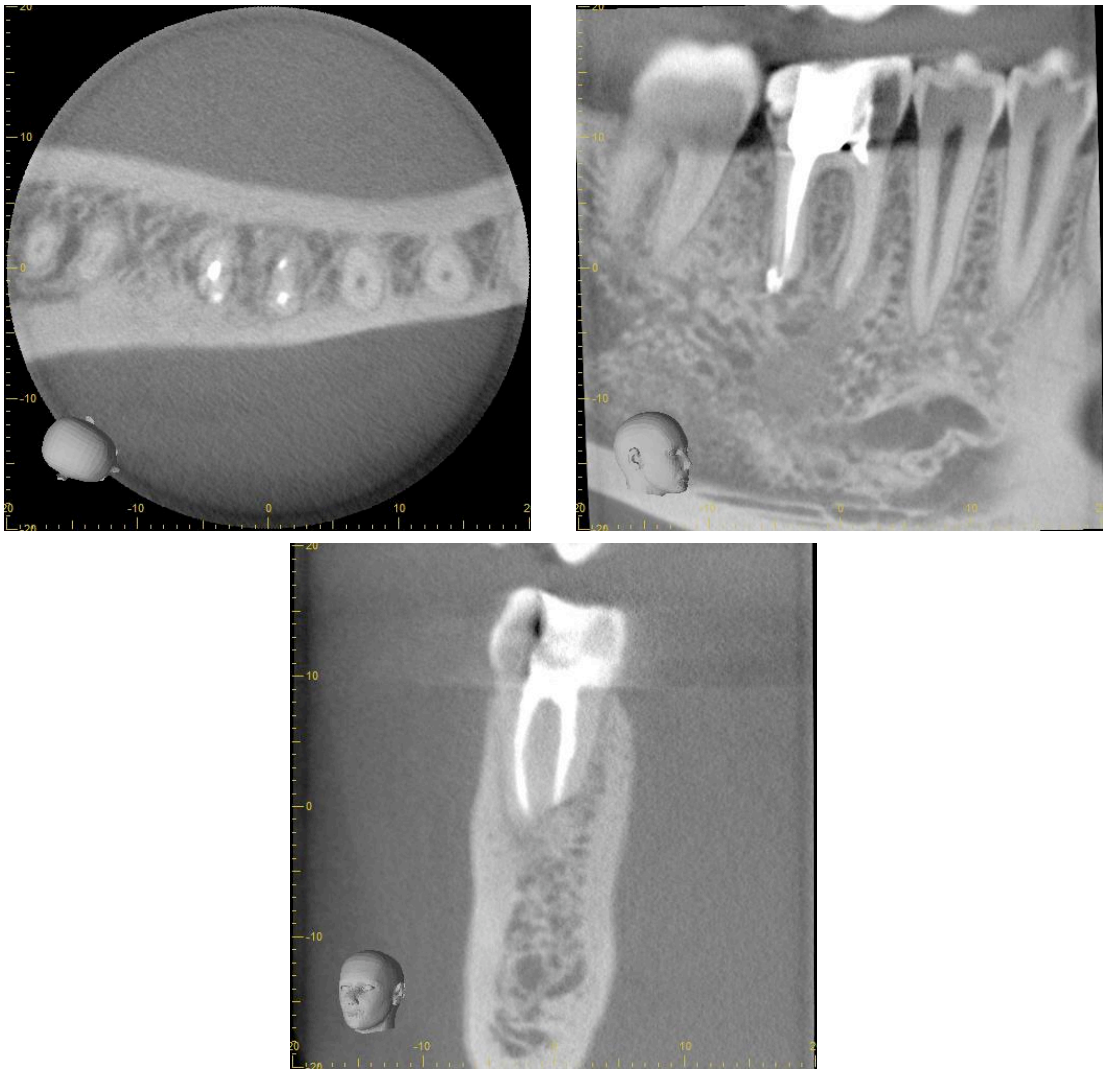

Figure 7(a): Follow-up CBCT image after 15 months; healing of lesion and buccal bone. (**b**): Follow-up CBCT image after 15 months; healing of lesion and furcation area. (**c**): Follow-up CBCT image after 15 months; healing of lesion and bone.

Figure 8: Follow-up radiograph after 20 months.

CBCT is a three-dimensional imaging method to view an individual tooth or the dento-maxillofacial region with high levels of hard tissue detail. Small volume CBCT can be a powerful tool in endodontic diagnosis, treatment planning and follow-up. The current evidence suggests that CBCT does have a higher sensitivity compared with periapical radiography for the detection of periapical lesions and missed canals. However, CBCT has limitations, and radiation dose to the patients must always be taken into consideration when selecting the modes of diagnostics [12-14]. The effective dose of CBCT scans is higher than periapical and panoramic radiography, but lower than multi slice computed tomography [14-16]. Therefore, small volume CBCT should only be taken where there are clinical signs and symptoms following root canal treatment when periapical radiographs cannot provide adequate evidence to explain this. It may also be helpful in complicated cases which are not healing and when a decision is needed whether to extract or to attempt further endodontic treatment, although the evidence for this is not strong [16, 17]. In this case, small volume (40x40 mm field of view) CBCT provided the valuable information about origin, location, size, extent of lesion and missed canal. After the retreatment of distal root canal, the tooth was healed. CBCT assessment which was taken 15 months after the treatment verified the healing.

When treating the large periapical lesions by nonsurgical retreatment method, elimination of the infection is very important. The polymicrobial infection makes sterilization of the root canal system difficult. Various medicaments have been widely used to help elimination of bacteria, reduce periapical inflammation, and induce healing. The most common intracanal medicament for disinfecting the root canals is calcium hydroxide which has it's effect on most of the bacteria because of its high pH. In the present case after removal of gutta-percha, calcium hydroxide medicament was applied. After a week, the fistula tract was healed and root canal treatment was completed. *E. faecalis* does not responds to calcium hydroxide as it resides deeper part of dentinal tubules where pH seen to be stable because of buffering action of dentin. Chlorhexidine gluconate is another commonly used as irrigant and intracanal medicament in endodontics. It is effective against wide variety of gram positive and negative bacteria, fungus and yeasts. The efficacy of chlorhexidine is because of positively charged chlorhexidine molecule which interacts with negatively charged microbial cell wall and thereby, increasing the permeability of the cell wall and precipitation of cytoplasmic contents resulting in cell death [18-20]. Therefore, in this case, chlorhexidine was used as the final irrigation solution before the obturation procedure.

CONCLUSION

Small volume CBCT is helpful to identify missed canals or to show the exact size and location of the periapical lesion before and after endodontic retreatment.

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