The Legs of a Tripod: Correct Radiography, Correct Diagnosis and Correct Treatment

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Abstract: The dentist can evaluate and precisely diagnose many oral diseases by radiographs. Correct and detailed clinical and radiographic evaluation is crucial for a successful treatment. The correct diagnosis and therapy depends on the fact that the dentist must properly use every instrument and interpret the results correctly. This case series emphasize 3 cases which presents challenging clinical circumstances for a clinician to diagnose and treatment planning.

Keywords: Crack tooth, cervical invasive root resorption, diagnosis, radiograph, radix entomolaris.

1. INTRODUCTION

The success of endodontic therapy depends on several factors, but one of the most important factors is the precise imaging of teeth and surrounding tissues. In endodontics, many challenging situations including complex anatomical structures or pathologies must be assessed more precisely.

Cracked teeth can usually be detected visually by observing a crack line (ideally using magnification devices such as dental microscope and loupe). If a crack line is adjacent with margin of restoration, this restoration must be removed to observe the entire crack line. The diagnosis of tooth cracks on radiographs can very difficult because X ray photons are passing through both a radiolucent fracture line and extensive a radiopaque sound tooth structure [1-4].

The other difficulty is complex anatomical structure. The root anatomy of teeth may be deviating from their normal morphology. Particularly in mandibular molars, these anatomical aberrations are important alterations. An additional root with a single canal which was separated or partially fused to other roots can be seen on the mesiobuccal (Radix paramolaris) or distolingual side (Radix entomolaris) [5-8].

Another challenging situation is Cervical Invasive Root Resorption (CIRR). This pathology is a comparatively rare and aggressive type of external root resorption that is initiated by the damage of the cementum immediately below the epithelial attachment. CIRR progressively resorbs the tooth structure such as; cementum, enamel and dentin, with conversion by fibrovascular tissue produced from the periodontal ligament. Although the etiology and pathogenesis of CIRR are not clear, the most common predisposing factors are orthodontic therapy, intracoronal bleaching, dental trauma and periodontal treatment [9-12].

The objective of this case presentation (crack tooth, radix entomolaris, invasive cervical root resorption) was to emphasize the importance of correct clinical and radiological diagnose leading to the correct treatment protocol.

2. CASE DESCRIPTION

2.1. Case 1

A 25-year-old male patient was referred to endodontics clinic with chief complaint of pain in the right maxillary posterior teeth. On the anamnesis, the patient stated that he had been feeling hypersensitivity on this region during the 10 months, but no diagnosis was identified (Figure **1**). After the clinical and radiographic examination, an extensive crack line was

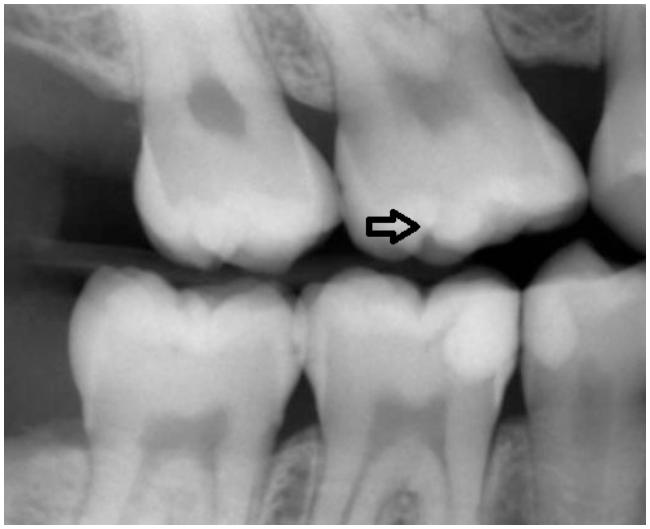

Figure 1: First periapical radiograph of right maxillary first molar (the crack line was not detected).

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detected on the right maxillary first molar tooth (Figure **2**). The thermal (cold test) and electrical pulp tests demonstrated that the tooth had a non-vital pulp tissue so that endodontic therapy was indicated. First, the tooth was anesthetized and a rubber dam was placed. Access cavity to the pulp chamber was prepared. Then, the working length was determined using an apex locator (Root ZX, J. Morita Inc., Japan). Cleaning and shaping of canals were performed using nickel-titanium (Ni-Ti) k-file, up to size 40. Copious irrigation was performed 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 15% EDTA for 60 sec and 10 mL distilled water. Then, the canals were dried with paper points and obturated with AH Plus sealer (Dentsply, Konstanz, Germany) and gutta-percha (Sure Dent Corporation, Korea) *via* the cold lateral compaction technique. Finally, glass-ionomer cement (Ketac Molar, 3M ESPE Dental AG, Germany) was used for sealing of the access cavity and then, patient was referred to the department of prosthetic dentistry for porcelain-crown restoration. At the 3.5-years recall, clinical and radiological examination revealed that the tooth was asymptomatic (Figure **3**).

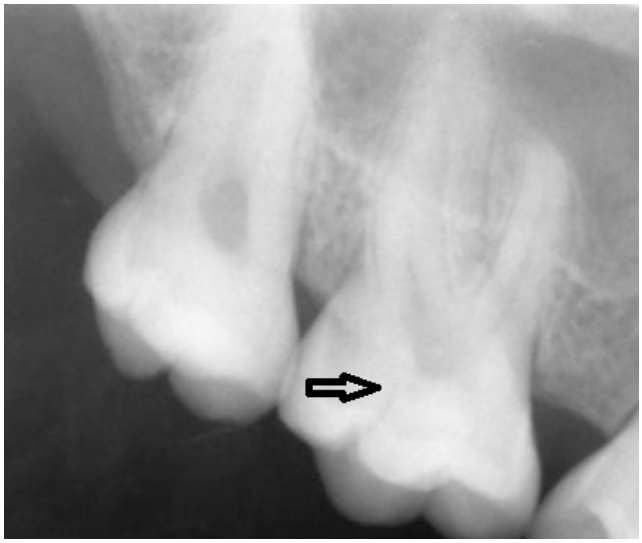

Figure 2: Second periapical radiograph of right maxillary first molar after 10 months (the crack line was detected).

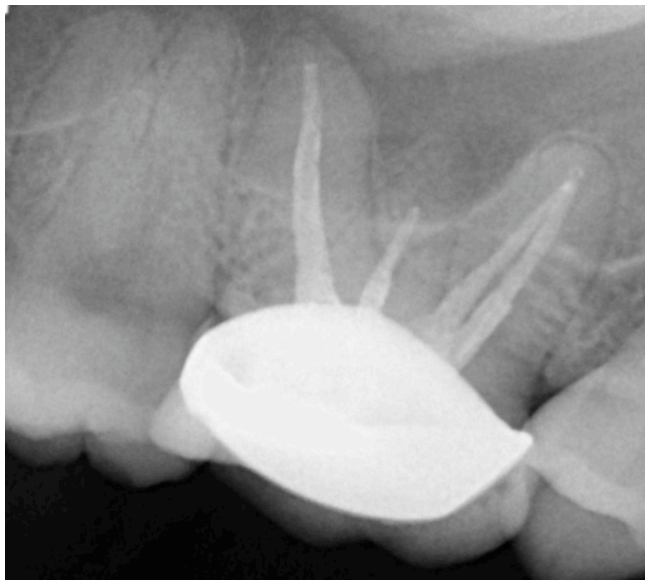

Figure 3: Follow-up radiograph after 3.5 years.

2.2. Case 2

A 39-year-old female was referred to endodontics clinic with complaint of severe spontaneous pain in the right mandibular posterior teeth. At the clinical examination periapical radiography revealed the presence of a huge lesion at the apical area and an additional distolingually located root (Radix entomolaris) in the right mandibular first molar tooth

Figure 4: Periapical radiograph of mandibular first molar tooth.

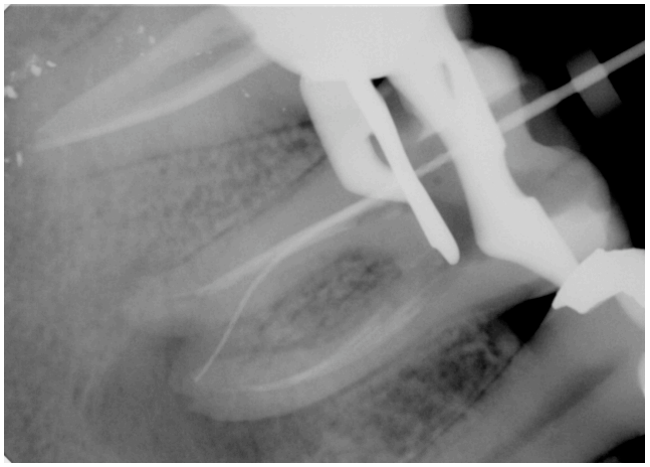

Figure 5: Detection of radix entomolaris canal with K-file (ISO size 10).

Figure 6: Follow-up radiograph after 33 months.

(Figure **4**). Retreatment endodontic procedure was performed. The tooth was anesthetized and a rubber dam was placed. After preparation of the access cavity, previous root canal filling was removed from coronal third of the canal with Gates-Glidden (GG) drills (size 4, 3 and 2) and then, Mtwo R (VDW, Munich, Germany) file sizes 25/0.05 and 15/0.05 in a crown-down manner was used. Additional root (Radix entomolaris) was detected (Figure **5**) and then, root canal preparation, irrigation and obturation was performed as described in Case 1 [with the exception; 2.5 mL 2% Chlorhexidine was used (after distilled water) as a final irrigation solution and the preparation of the root canals was performed with NiTi hand file instrument + Protaper Next NiTi rotary system]. At the thirty three months recall, periapical radiograph showed healing of the lesion (Figure **6**).

2.3. Case 3

A 42-year-old female was referred the school of dentistry for routine dental examination. After clinical examination, a digital panoramic radiograph was obtained and radiographic image of the right mandibular central incisor tooth showed an unexpected extensive irregular radiolucency that extended from the cervical area into the tooth crown and root (Figure **7**). The patient had history of previous orthodontic therapy. The tooth responded positively to the pulp testing. A periapical radiograph was taken and irregular radiolucent area was identified as Class 3 CIRR (Figure **8**). Endodontic therapy was performed as described in Case 1 [with the exception; the coronal third of root canal was enlarged with GG drills (size 4, 3 and 2) to exclude any resorptive tissue] and resorption area was sealed with glass-ionomer cement. At the five years recall, a periapical radiograph showed that the tooth was healthy (Figure **9**).

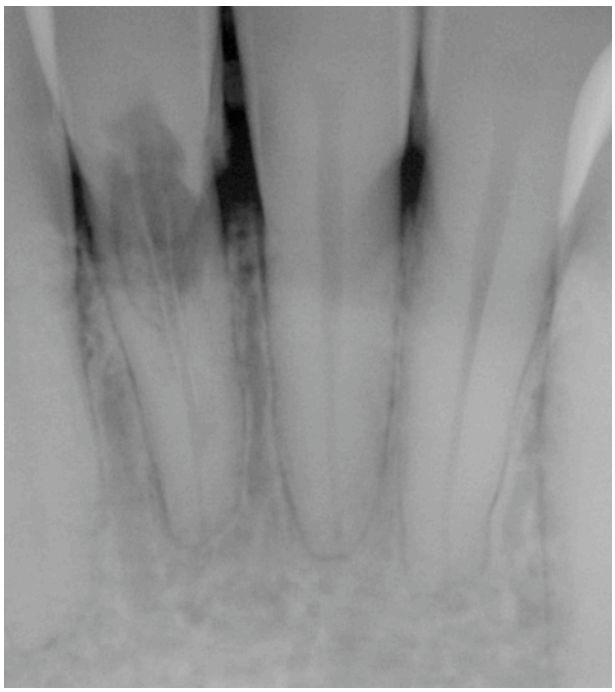

Figure 8: A characteristic radiopaque view of predentin layer which surrounding the pulp.

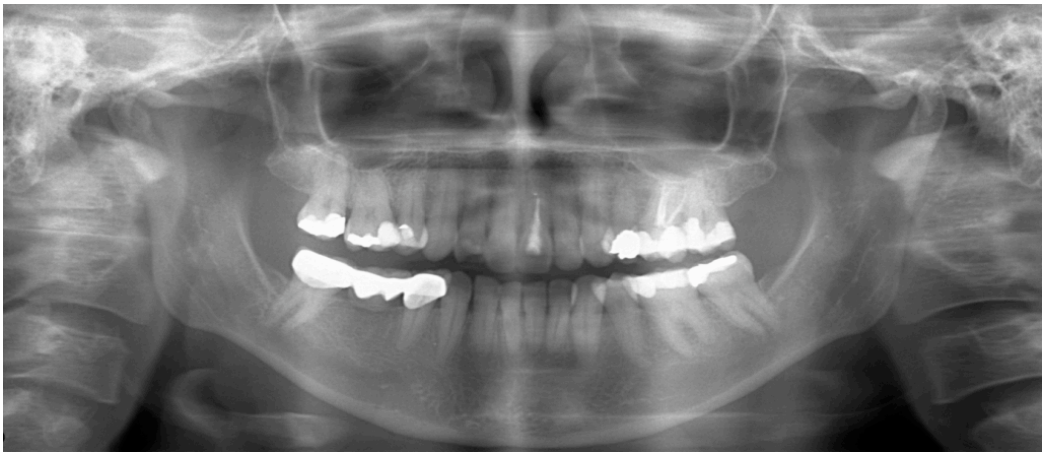

Figure 7: Panoramic radiograph for routine dental examination.

Figure 9: Follow-up radiograph after 5 years.

3. DISCUSSION

Correct and detailed clinical and radiographic evaluation is crucial for the successful treatment. Several diagnostic methods have been suggested for detection of the cracked tooth such as; conventional visual inspection, trans-illumination, microscope, periapical radiograph and cone beam computed tomography. Treatment procedure of a cracked tooth depends on the periapical and pulpal conditions. Many patients are referred to dental clinics after a long time has passed since the symptoms started. Early diagnosis can help to prevent the propagation of the crack into the pulp chamber; likewise, a tooth with an extensive crack of long duration may most probably require root canal therapy [13]. In case 1, when the patient with severe pain was referred to the Department of Endodontics, 10 months had already passed from the first examination. On the other hand, periapical radiograph showed that an extensive crack line near to pulp horn. In addition to, pulpal condition of tooth (non-vital) revealed necessity of an endodontic treatment.

Comprehensive knowledge of the root canal morphology is an essential prerequisite for the success of root canal treatment. Adequate diagnosis and treatment of root canals are challenging because of the complexity of the root anatomy. Periapical radiography and cone beam computed tomography imaging have an important role in daily practice. Mandibular molar teeth may have an additional root located lingually (radix entomolaris) or buccally (radix paramolaris). The dentist should carefully make the radiographic examination, because radiographically, a double periodontal ligament image or an unclear view or outline of the distal root contour or the root canal can also be hint of the existing of an radix entomolaris. It can pose multiple and significant endodontic problems (such as; furcal or strip perforation, unobturated root canal and instrument separation) due to morphological variation. Especially, initial cleaning and shaping with hand instruments is recommended to prevent instrument separation [6,14]. In case 2, periapical radiograph showed endodontically treated mandibular first molar tooth with a huge lesion at the apical area, and also, an additional root in the distolingual side of tooth (Radix entomolaris). Retreatment endodontic procedure was performed, and thirty-three months later, periapical radiograph showed healing of the lesion

Similarly, knowledge of the clinical and radiologic appearance of CIRR is required for the diagnosis and successful treatment. Radiographic image of this lesion can be confused with dental caries, but very important difference is a thin layer of predentin which protected the pulp tissue from the cervical invasive lesion. The periapical radiographic image of this layer is a radiopaque line usually separating the image of the lesion from the pulp [15]. In case 3, Class 3 CIRR was identified after routine radiographic examination with no symptoms. Five years later, clinical and radiological examination revealed that the tooth had no symptom and was healthy

CONCLUSION

The success of endodontic treatment depends on the three stages; correct radiography, correct diagnosis and subsequent correct treatment.

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