

## Case Report

## Acute apical periodontitis and vertical root fracture of the same tooth: a case report

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**Abstract:** Vertical root fracture is a frequent complication in endodontically treated teeth and usually leads to extraction of the affected tooth. Differential diagnosis may be difficult, especially in patients with periodontal and endodontic disease. This case report describes the diagnosis and clinical and radiographic features of apical periodontitis and vertical root fracture of the same tooth, which were separated by an interval of several years. Vertical root fracture of the mesial root was diagnosed with the help of an exploratory flap and microscopic observation. (J Oral Sci 55, 187-190, 2013)

Keywords: root canal treatment; crown; vertical root fracture; apical periodontitis; diagnosis.

### Introduction

Functional pain (i.e., when chewing) in an endodontically treated tooth is usually clinical evidence of periapical disease or root fracture; however, differential diagnosis may be difficult. Apical periodontal lesions are frequently encountered pathologies (1) for which the principal diagnostic signs are pain on percussion/pressure and periapical radiolucency. The bacterial origin of such lesions has been demonstrated in many studies (2). Fracture and vertical root fracture (VRF) occurring after endodontic treatment are complications that often lead to extraction of the affected tooth. Fracture may

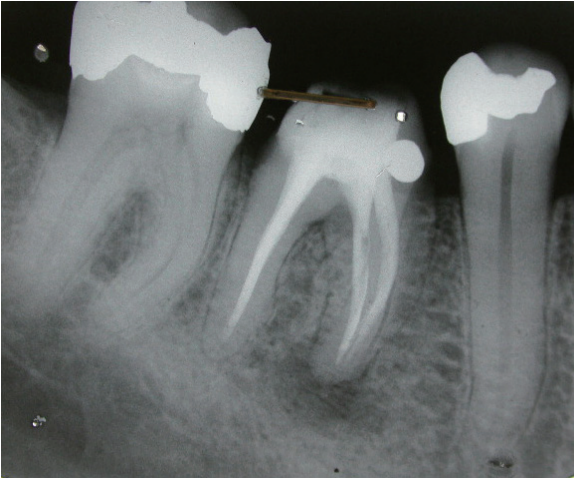
occur during the endodontic or restoration phases but can also result from several other factors, including occlusal stress (3,4). Depending on the cause, the fracture may begin at the apical level and extend coronally, or it may begin at the cervical area and extend to the apical region. On the transverse plane, fractures always begin from the inside, starting at the canal wall and extending toward the exterior of the root surface. Diagnosis is often late, i.e., several years after the endodontic and prosthetic procedures, and is sometimes made more difficult by the relative absence of clinical and radiographic signs. Use of an exploratory flap and diagnostic aids like the operating microscope permits clinicians to optimize diagnosis and rule out other pathologies (5). We describe a case of fracture of the mesial root of a mandibular molar that, several years before, had been treated for a periapical lesion of endodontic origin.

### Case Report

#### History

The patient was a 75-year-old man who presented for consultation in December 2006. He was referred by his practitioner because of difficulty in chewing and an associated radiolucency in the mesial root of the right mandibular first molar. The patient was in good health (American Society of Anesthesiologists score = 1), had no known allergies, and was a nonsmoker. His cardiologist prescribed 50 mg of aspirin per day as a preventive measure, due to suspicion of myocardial infarction. The patient brought his radiographic records with him. In 1984 he had been referred to the dental service of the Hotel Dieu in Paris by his treating practitioner because of a painful AAP involving the mesial root of the right mandibular first molar. The tooth had already been

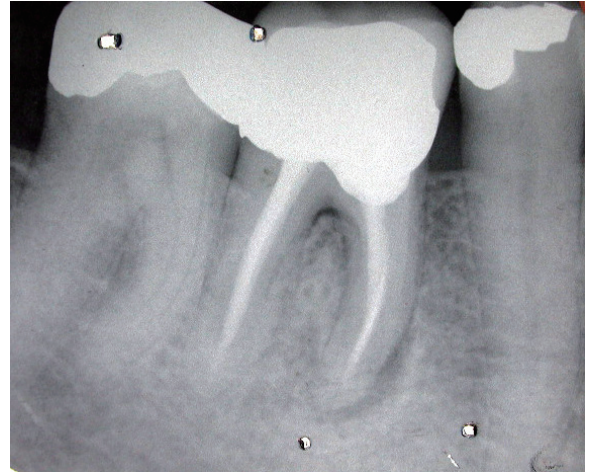
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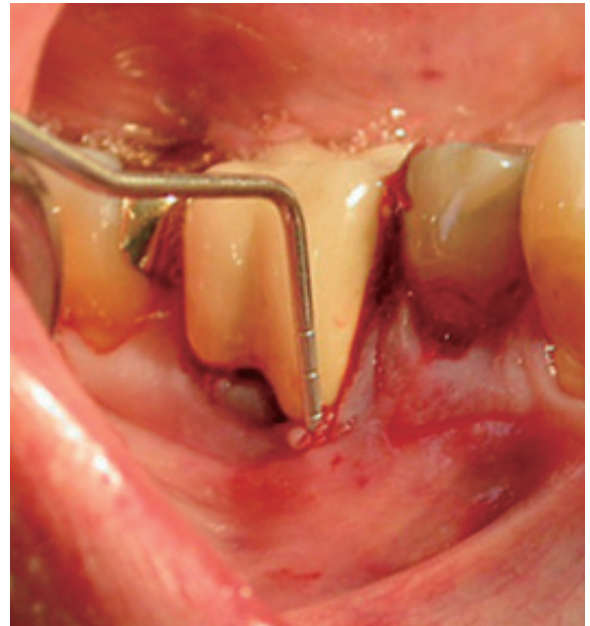
**Fig. 1** Tooth 46: radiograph taken in 1984 after post-endodontic retreatment. The patient was referred to a hospital by his practitioner because of failure of initial endodontic treatment associated with pain. The lesion is centered around the apex of the mesial root.



**Fig. 2** Follow-up radiograph at 14 years shows healing of the periapical lesion. The tooth was asymptomatic.



**Fig. 3** Diagnostic radiograph taken in 2006. The patient had consulted his dentist because of pain upon mastication. The practitioner referred the patient to the hospital treatment center for consultation. The lesion differed from that in Fig. 1: note the lateral extension of the mesial root.



**Fig. 4** Probing revealed a deep narrow region of bone loss typical of radicular fracture.

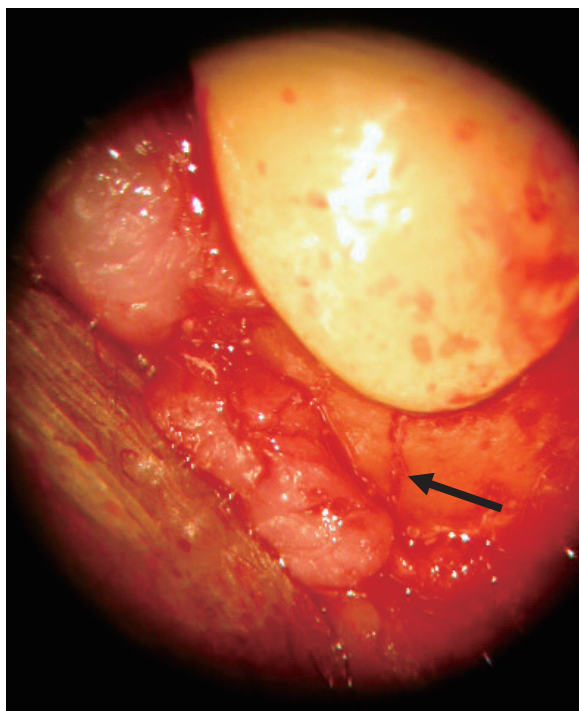
endodontically treated, but the radiographic record was not available. Endodontic retreatment was performed (Fig. 1). A porcelain/metal crown without an inlay core was later placed, a year after the endodontic treatment. Follow-up radiographs at 7 and 14 years, and the absence of clinical signs during this period, indicated that the lesion had successfully healed (Fig. 2).

In December 2006, the patient consulted his practitioner because of difficulty in chewing associated with the right mandibular first molar. The radiograph provided by the treating general dentist showed a periapical lesion involving the mesial root (Fig. 3). The patient did not report any traumatic episodes or events (e.g., mechanical

stress on teeth, noises).

#### **Clinical examination**

Findings from visual examination were unremarkable. Examination of the pericoronal joint showed no evidence of any anomaly. Periodontal probing revealed a deep narrow buccal lesion along the mesial root (Fig. 4). Apical palpation was not painful, and no mobility was noted. Axial and transverse percussion tests were positive. Axial pressure was painful.



**Fig. 5** Microscopic observation of the mesial root after a small exploratory flap was raised. A vertical fracture of the root is visible (arrow).

## Discussion

The causes of vertical root fracture (VRF) of endodontically treated teeth are numerous and can be classified as predisposing and iatrogenic factors (4). Predisposing factors mainly comprise certain root morphologies – for example, flattening of the canals in the mesiodistal dimension, such as the mesiobuccal root of the molar, seen in the present case – but also include age and quality of dentinal tissue. The iatrogenic factors are primarily related to endodontic procedures and prosthetic restorations but also include the chemical effects of endodontic irrigants and medicaments on dentine, the effects of bacterial interaction with dentine substrate, and volumetric modifications due to the corrosion of metallic post-core elements. Diagnosis of VRF is sometimes difficult due to the lack of pathognomonic clinical and radiographic signs and because of the similarity with other pathologies of pulpal or periodontal origin.

According to Tamse (6), clinicians should use the following method to establish a diagnosis of vertical root fracture: ascertain the complete history of the tooth and its susceptibility to cracking or fracture; note pain on mastication; using periodontal probing, identify any buccal bone lesion; take periapical radiographs in two dimensions to analyze cracks or fracture lines; and raise an exploratory flap to allow use of optical aids to view cracks and fracture lines. The most frequent radiographic features of VRF are a “halo” appearance (combined periapical and perilateral radiolucency on one or both sides of the root), lateral periodontal radiolucency along the side of the root, and angular radiolucency from the crestal bone terminating along the root side (7). In addition, radiolucency in the furcation area is often observed in mandibular molars. However, several studies have shown that conventional radiography has low sensitivity for detecting VRFs in root canal-filled teeth: 51.4% in the buccolingual dimension and 7.7% in the mesiodistal dimension. A recent systematic study concluded that there were no evidence-based data on the diagnostic accuracy of radiographic dental evaluation for diagnosis of VRF in endodontically treated teeth (7). Cone-beam computed tomography (CBCT) might be better, due to its superior diagnostic accuracy (sensitivity 88%, specificity 75%) (8). The diagnostic approach advocated by Tamse (6) was followed in the present case; however, a second radiograph was not necessary, and apical periodontitis and lesions of periodontal or endoperiodontal origin were excluded.

Apical periodontitis (AP) is generally caused by reactivation of bacteria present in the root canal, coronal leakage after removal of a crown, or percolation that

## Radiographic examination

Analysis of the radiograph revealed a radiolucency on the mesial side of the apex, which was associated with a radiolucency observed at the furcation level (Fig. 3). The dimensions and topography of the lesion differed from those of the earlier lesion, of 1984, which had been larger and centered on the apex (Fig. 1). The new topography was strongly indicative of a crack or vertical root fracture. On the basis of these findings, various diagnostic hypotheses were considered, namely, recurring infection of the original lesion; secondary contamination of the endodontic region subsequent to coronal percolation caused by deterioration of the prosthetic junction; periodontal or endoperiodontal lesion; and a crack or vertical root fracture. To confirm the diagnostic hypothesis of vertical root fracture, a small exploratory flap was raised. Under microscopic observation (OPMI Pico Ziess, Oberkochen, Germany), vertical root fracture of the mesial root was confirmed (Fig. 5).

## Treatment

It was decided to proceed with a hemisection followed by extraction of the mesial root and subsequent placement of a bridge, using the distal roots of the right mandibular first molar and right mandibular second premolar as abutments.

alters the bacteriologic equilibrium. In the present case, coronal leakage was eliminated as a potential cause because the crown was placed 1 year after endodontic treatment and had not been modified or removed during the subsequent 21-year period.

Probing of the prosthetic junction showed no evidence of anomalies, and marginal fit was correct. Clinical and radiographic examinations at 7 and 14 years showed signs of treatment success, with almost complete disappearance of the initial lesion.

Periodontal and endoperiodontal lesions were also considered and rejected as a cause, due to the absence of a bone defect and the lack of other bone defects or pockets elsewhere in the mouth.

Ultimately, pain upon mastication, which was felt at the right mandibular first molar, and the sign of a specific deep bone defect, which was found upon probing the sulcus, are the principal signs of cracking or vertical root fracture. To confirm this diagnosis, a small flap was raised to expose the mesial root. Microscopic observation revealed that a vertical fracture line on the mesial root of this tooth had caused the periradicular lesion.

It is difficult to speculate on the mechanisms leading to this fracture, since the patient reported no changes in masticatory habits or events of hard biting and the crown had been in place for 21 years. Studies report an increased risk of VRF when an endodontically treated tooth is not protected by a crown. In addition, the design of a restoration (e.g., amount of dentinal tissue removed; presence and type of post; presence, location, and dimensions of a ferrule) is important in preventing VRF (9).

The present clinical case is interesting because it shows the differing topographic characteristics of apical

periodontitis and cracking/vertical root fracture of the same tooth. Careful history taking, clinical examination, and use of optical devices allowed for correct diagnosis of the patient's condition.

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