

# Persistent Gingival Swelling and Fistula Obscured Horizontal Root Fracture: A Case Report

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Horizontal root fracture (HRF) is a result of trauma to teeth and periodontium, which implies severe injury to cementum, dentin, and pulp. This is a rare case of HRF in the maxillary lateral incisor of a 62-year-old male who only presented persistent gingival swelling, fistula, and dull pain at first. An apical radiolucency of unknown origin turned out to be a result of hidden HRF at the coronal third level that was later visualized radiographically during endodontic treatment. The tooth was scheduled to be extracted upon the patient's agreement. The purpose of this report is to alert clinicians about the importance of diagnosing HRF through thorough clinical and radiographic examinations. Where there is persistent fistula without proper cause, HRF should be considered as a causative factor, and the diagnosis could be effective with aid of cone beam computed tomography, electronic root apex locator, as well as other clinical signs.

**Key Words:** Case report; Fistula; Gingival swelling; Horizontal root fracture

## Introduction

Horizontal root fracture (HRF) results from trauma to a tooth and its supporting apparatus, which means injury to the dentin, cementum, and pulp<sup>1)</sup>. The incidence of HRF is reported to be low, ranging from 0.5% to 7% when compared with other forms of dental injuries<sup>2)</sup>. HRF usually occurs in the maxillary central and lateral incisors: 68% and 27% indepen-

dently, mainly in the middle third of the root, while it rarely occurs in the coronal and apical third<sup>3,4)</sup>. The prognosis, diagnosis, and treatment can vary depending on the root fracture location<sup>4)</sup>. Treatment is usually directed at repositioning and stabilizing the tooth or keeping the vitality of the remaining pulp if necessary. Treatment outcome may be affected by several factors: root formation stage, degree of tooth dislocation or displacement, and root maturity<sup>5)</sup>. This

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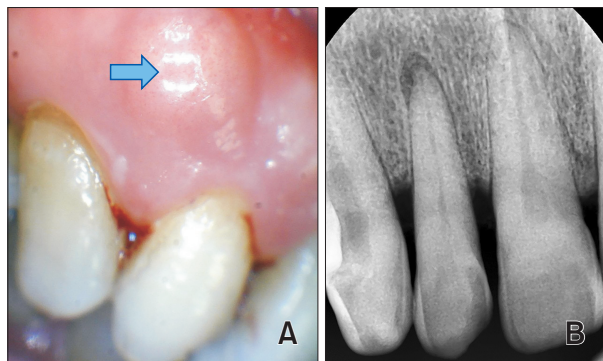
article presents a case report of the maxillary lateral incisor with persistent gingival swelling and fistula at first, which was diagnosed later as a HRF at the coronal third level.

### Case Report

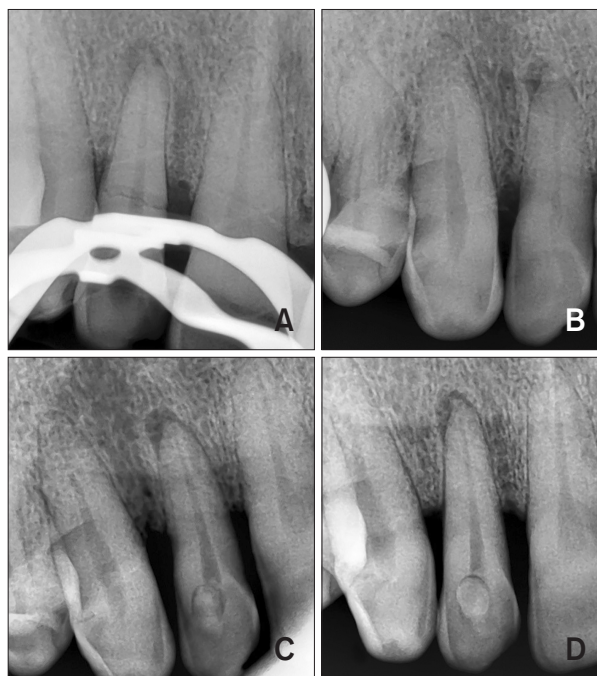
A 64-year-old male with a chief complaint of spontaneous, dull pain and gingival swelling around the maxillary right lateral incisor was referred by an oral and maxillofacial surgeon for endodontic treatment. His medical history revealed a prolonged perioral anticoagulation therapy due to a previous cerebrovascular accident. The toothache started 2 weeks prior to visiting the clinic, with gingival swelling becoming apparent 1 week before his appointment. The patient did not report any recent history of trauma or teeth injury. The maxillary right lateral incisor had a degree 1 mobility, and a round, well-defined gingival swelling with fistula was noticed in the middle third of the labial gingiva of the tooth (Fig. 1A). When probing, the mesial side was measured as 5 mm and the other sides were within 3 mm depth. A small incisal fracture, moderate periodontal bone loss, and an apical lesion were seen in the radiographs (Fig. 1B). Since there had not been any history of recent trauma or deep caries, informed consent for possible tooth crack and pulpal necrosis due to

old trauma/unknown origin was explained to the patient. A routine root canal treatment was planned. The patient was prescribed perioral medication of Augmentin® (Il-sung, Seoul, Korea), 625 mg (Amoxicillin/Clavulanic acid) and Tylenol® (Janssen, Seoul, Korea) t.i.d. for 4 days.

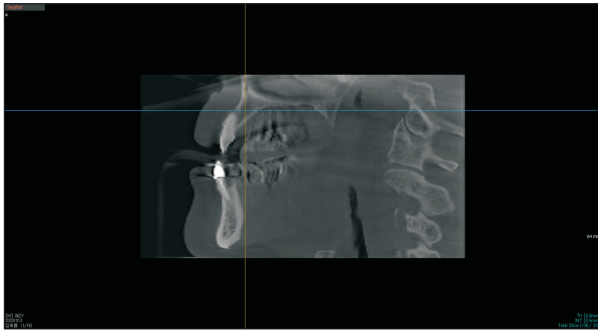
On his first visit for the endodontic procedure, the swelling was persistent despite the previous medication. The pulp was necrotic at the time of access cavity preparation, but there was no exudate or pus within the root canal. A working length of 21 mm was measured with a #15 K file by an electronic apex locator (EAL). The existing gingival swelling persisted on the subsequent visit after the pulp extirpation and canal enlargement. On the third visit, the fistula and swelling had subsided. Therefore, root canal filling was scheduled. However, a bloody exudate appeared within the root canal on the scheduled day for canal obturation, and EAL directed the apex



**Fig. 1.** (A) A gingival swelling and fistula located around the right maxillary lateral incisor at the initial visit (arrow). (B) The initial x-ray of the related tooth. Small apical radiolucency was seen at the root apex, but no definite horizontal root fracture was detected.



**Fig. 2.** (A) A definite visualization of the horizontal root fracture (HRF) on the visit for canal filling. (B~D) Series of x-rays from different angles during the endodontic treatment were listed in chronological order. Still, the HRF was not quite visible. Several bony trabecular patterns and the superimposition of the alveolar bone crest level made it challenging to discriminate an HRF.



**Fig. 3.** A sagittal cut of the related tooth in cone-beam computed tomography scans, horizontal root fracture was hard to recognize.

sign at the canal orifice. An HRF in the coronal third was finally visualized in the periapical x-ray, and the tooth was scheduled to be extracted after obtaining the patient's agreement (Fig. 2A).

Following a thorough review of his previous dental history and routine check-up dental panoramic views, a small incisal fracture of the tooth had existed in the x-ray since his first visit, which was 5 years ago, and the periapical radiolucency appeared 2 years ago. Also, his upper right 1st molar had been extracted 4 years ago due to a vertical crown-root fracture. In contrast, HRF had not been visualized in the serial x-rays of various angles during the endodontic treatment (Fig. 2B~D).

A cone-beam computed tomography (CBCT) was taken before the tooth extraction to evaluate the appropriateness of implantation. Still, it was hard to pinpoint the fracture line in the CT scans (Fig. 3). An inspection of the tooth after the extraction revealed an oblique HRF crossing downward from the palatal gingival level to the coronal third of the labial side (Fig. 4). Written informed consent was obtained from the patient.

## Discussion

Root fractures are diagnosed by clinical symptoms, radiographic findings, and sometimes surgical findings. The radiographic diagnosis using periapical x-rays is limited and evident only in 50% of cases<sup>1,6</sup>.



**Fig. 4.** The extracted tooth. An oblique fracture crossed from the gingival area of the palatal side down to the coronal third of the labial side of the root.

Moreover, HRF may not be detected depending on various x-ray angles, particularly if the fracture line is parallel to the x-ray beam<sup>7</sup>. Minimal fracture displacement and superimposition with other anatomical structures make it challenging to detect HRFs in conventional x-rays<sup>1</sup>.

EALs were reported as accurate and acceptable clinical tools in detecting HRFs<sup>8</sup>. However, in the present case, Root Zx<sup>®</sup> (J Morita, Tokyo, Japan) was not able to discriminate HRF at first, but later, it could detect HRF as the fracture displacement increased. CBCT is considered a useful diagnostic tool to diagnose HRF in this aspect<sup>2,6,9</sup>. A report demonstrates that HRF is the most common type of traumatic injury, and the number of vertical root fractures was more significant on the non-vital teeth, while HRF was larger on vital teeth by investigating CBCT scans<sup>6</sup>.

Healing of HRFs can occur by the interposition of 1) calcified tissue, 2) connective tissue, or 3) bone tissue, and the healing depends on the health of the periodontium and pulp. Immediate endodontic treatment should be avoided because the incidence of pulpal necrosis of HRF is about 20%<sup>5</sup>. The decision for root canal treatment may be made after 3 months of follow-up if the involved tooth does not respond to pulp vitality tests and radiolucency ap-

appears around the fracture line in the x-ray or the apex. Nowadays, HRFs are successfully diagnosed and treated with the aid of CBCT and endodontic treatment using a bioceramic or mineral trioxide aggregate apical plug if the fracture line is located in the middle or apical third of a root<sup>1,10-12</sup>. Unfortunately, the related tooth in the present case was decided to be extracted due to the poor prognosis because the fracture line was in the coronal third of a maxillary lateral incisor with moderate alveolar bone resorption.

This case demonstrates the difficulty of diagnosing a hidden or micro-HRF occurring in the cervical third of a root, especially if it happens in the maxillary incisors. Shadows of the palate and nose and the alveolar bone crest in the radiograph make it challenging to differentiate a HRF line from them. Although serial periapical x-rays with different angles were taken initially and during the endodontic treatment, superimposed trabecular bone patterns crossing the tooth root made it hard to reach a definitive diagnosis of HRF. The final diagnosis of HRF in the present case was achieved only after an abnormal signal of EAL and the solid visualization of the fracture line in the periapical x-ray.

HRFs are not readily discernible on periapical x-rays, and the clinical and radiographic presentation variability makes the diagnosis challenging. This report aims to alert clinicians about the importance of diagnosing HRF using thorough clinical and radiographic examinations. Where there is a persistent fistula without proper cause, HRF should be considered as a causative factor. The diagnosis could be effective with CBCT, electronic root apex locator, and other clinical signs.

## Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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