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A Maxillary Lateral Incisor with Type V Canal Morphology: A Case Report

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A detailed root canal morphology description is of utmost importance for the success of endodontic treatment. Therefore, clinicians require a thorough knowledge of the root canal anatomy and its variations and anomalies in all the tooth types. This study reports a permanent upper lateral incisor exhibiting an uncommon root canal system morphology: a single-rooted tooth with one main root canal bifurcating into two distinct root canals in the apical third, with two apical foramina (type V root canal morphology).

Keywords: Dental pulp cavity; Incisor; Root canal; Root canal therapy; Tooth abnormalities; Tooth root

Introduction

Endodontic treatment entails thorough debridement and shaping of root canals, followed by a hermetic seal with obturation materials. Therefore, the long-term success of endodontic treatment relies on proper access to the entire root canal system, necessitating clinicians' thorough knowledge of the anatomical diversities of the root canal system. Failure to recognize and treat an extra-canal might provide a constant source of irritation, thereby compromising the long-term success of endodontic treatment [1, 2].

Many studies have explored the root canal morphology of maxillary incisors, with the majority reporting only one root in these teeth with one root canal in all the cases [3-8]. Also, according to the endodontic literature, maxillary lateral incisors have a single root and a single root canal. However, some studies have reported multiple canals in 3% of maxillary incisors [9] and two canals in 3% of maxillary lateral incisors [10]. In addition, some studies have reported the presence of more than one root in the maxillary lateral incisors [11]. The presence of multiple root canals in these teeth is a rare finding and is limited to some case reports [12, 13]; many of these reported cases are the result of anatomical abnormalities such as gemination (development of two teeth from one tooth bud and, as a result, the patient has a larger tooth with completely or incompletely separated crowns but a normal number of teeth), fusion (union of two normally separated, adjacent tooth germs and, as a result, the patient would appear to have one missing tooth), concrescence (the connection of two teeth by cementum only, occurs after root formation, due to trauma or crowding of teeth where the interdental bone has been lost and the two roots have come into contact), or dens invaginatus (a developmental abnormality in which there is a communication from the surface of the tooth toward the pulpal tissue or root) [14-22].

This study reports the endodontic treatment of a maxillary left lateral incisor with a type V root canal system, which had not been diagnosed by the previous dentist.

Case Presentation

A 27-year-old female patient presented to the Dental School of Mashhad University of Medical Sciences due to incomplete endodontic treatment of her maxillary left lateral incisor (tooth #10). Clinical examination revealed the tooth had an access cavity filling with no temporary material. The tooth did not respond to the vitality tests (electric pulp testing, heat test, and

Figure 1. Preoperative periapical radiograph of the maxillary left lateral incisor

Figure 2. *A)* CBCT scan of the maxillary left lateral incisor; *A)* Sagittal view; *B)* Axial view shows the bifurcation of canals in the apical third

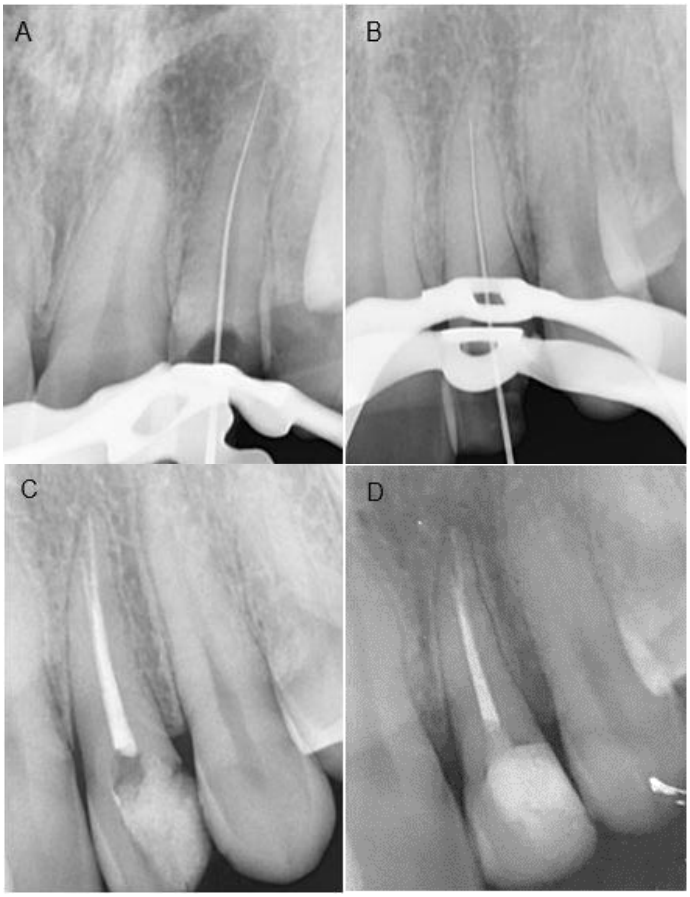

Figure 3. Periapical radiographs of the maxillary left lateral incisor: *A)* The working length radiograph; *B)* The radiograph taken after detecting the extra root canal; *C)* Final radiograph; the two root canals were obturated; *D)* The follow-up radiograph after six months

cold test), while the responses of the adjacent teeth were within normal limits. No sinus tract was present, the probing depth was normal (3mm), and the tooth was not painful on palpation; however, there was apical tenderness on percussion. The patient's general health was good, with no apparent medical conditions.

The initial conventional periapical radiograph of the tooth did not suggest any anatomical variations (Figure 1); however, visual inspection of the root canal anatomy using cone-beam computed tomography (CBCT) revealed a second root canal in the apical third on the sagittal view, with two root canals in the axial view (Figures 2A and 2B).

At first, the treatment process was explained to the patient and the treatment was performed after completing the informed consent form. The access cavity outline was corrected after isolation with a rubber dam. In the initial step, it was not possible to negotiate the entire path of the main root canal with a straight #10 K-file (Dentsply Maillefer, Ballaigues, Switzerland). The file was approximately 4 mm short of the root canal length, which was probably the main reason for the patient's referral. Finally, we were able to negotiate the entire path of the main root canal using a precurved #10 K-file with watch-winding movements. Then, the working length was established with an apex locator and confirmed radiographically (Figure 3A). Next, the root canal orifice was extended using ProTaper Gold SX (Dentsply Tulsa Dental, Tulsa, OK, USA). It was instrumented with stainless steel hand K-files up to #15 (FlexoFiles, Dentsply Maillefer, Ballaigues, Switzerland), followed by Hero shaper rotary system (Micro Mega, Besancon, France) up to size 25/0.04 under copious irrigation with 5.25% sodium hypochlorite and 17% EDTA solution (Chlora, Cerkamed, Stalowa, Poland). An ultrasonic activator (Eighteeth, Changzhou Sifary Medical Technology Co., Changzhou City, China) was used to increase the cleaning efficacy. Then, we searched the extra root canal in the buccal position with a #10 K-file by pre-curving the file buccally. After finding the second root canal, another radiograph was taken, which confirmed the

second root canal (Figure 3B). Finally, the root canal underwent chemical and mechanical debridement with stainless steel K-files up to #20.

The root canals were dried with sterile paper points after irrigation with saline solution. The root canals were obturated by warm vertical condensation technique using gutta-percha (Meta Biomed Co., Chungcheongbuk do, Korea) and AH-26 sealer (Dentsply DeTrey, Konstanz, Germany). The tooth was then temporarily restored and underwent a postoperative periapical radiographic examination, which showed that both root canals were optimally obturated (Figure 3C). Finally, the access cavity was restored with composite resin. A follow-up radiograph was taken after six months (Figure 3D).

Discussion

Maxillary lateral incisors generally have one root with a single-canal, confirmed in many studies [3-8]. However, some reports indicate that these teeth have multiple root canals [11-14, 21], which might be considered dental anomalies. In addition, abnormal development of the tooth and root, including gemination, fusion, dens in dent, dens invagination, palatogingival or distolingual groove, and some changes in the normal development of the Hertwig's epithelial root sheath might give rise to two root canals or two roots in maxillary incisors [23-27].

In our case, clinical and radiographic examinations confirmed the normal size and shape of the crown. Also, no invagination of enamel or dentin was observed. Thus, developmental anomalies such as gemination, fusion, dens in dent, and palatogingival or distolingual groove were ruled out.

Comprehensive knowledge about the morphology and variations of the root canal system, use of magnifying loupes or microscopes, taking intraoral periapical radiographs from different angles, and precise radiographic interpretation help clinicians successfully identify such cases [28]. However, conventional radiographs provide 2D images of 3D objects. Advances in dental imaging techniques such as cone-beam computed tomography, a high-resolution technique, have significantly helped understand 3D root canal morphology and identify such anatomical variations [6, 29, 30].

Conclusion

This case report presented the procedural steps to manage a maxillary lateral incisor with a type V root canal morphology. The reported case is important clinically because maxillary lateral incisors might exhibit more than one canal. It also suggests a more significant variation in the root canal morphology of permanent maxillary lateral incisors than population studies. The CBCT technique can help recognize the anatomic variations of the root canal system.

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Conflict of Interest: 'None declared'.

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