The Use of a Novel Approach for the Instrumentation of a Cone-beam Computed Tomography–discernible Lateral Canal in an Unusual Maxillary Incisor: Case Report

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Abstract

Lateral and apical ramifications of the main root canal create potential pathways through which bacteria can spread and remain unaffected by treatment procedures. It is a challenge for the specialty to find techniques that can predictably reach, disinfect, and obturate these ramifications. Here, we report the use of a novel instrumentation approach to aid in the negotiation and management of a lateral canal discernible on cone-beam computed tomography (CBCT) in an unusual maxillary central incisor. A 23-year-old female patient was referred for evaluation and possible treatment of tooth 9. The periapical radiographic examination revealed pulp chamber obliteration, existence of a lateral lesion, and a possible complex internal root canal anatomy. The CBCT evaluation revealed the existence of a lateral lesion, a periapical lesion, an additional distopalatal canal, and a lateral canal exiting at the lateral lesion. The diagnosis of asymptomatic apical and lateral periodontitis of tooth 9 was reached. CBCT-aided access cavity preparation and scouting resulted in the successful negotiation of all canals, main and lateral. A novel instrumentation technique with precurved controlled memory files was used for the mechanical preparation of the lateral canal to a 25/04 enlargement. Obturaton of the lateral canal was achieved with a single gutta-percha cone and AH Plus Root Canal Sealer. At the 2-year follow-up, the patient was asymptomatic, and the 2-dimensional radiographic examinations revealed resolution of both the periapical and the lateral lesions. This case report describes the application of a novel instrumentation technique for the mechanical debridement of an infected lateral canal discernible on CBCT and reinforces the importance of treating the root canals as systems that possesses anatomic intricacies that need to be addressed. *(J Endod 2017;■:1–5)*

Key Words

Cone-beam computed tomography, controlled memory, lateral canal, precurved files, root canal anatomy

Significance

Exuberant biofilm infection in lateral canals has been implicated with endodontic treatment failure. An instrumentation technique that can incorporate lateral canals in the disinfection process is of clinical relevance and should be considered an important goal of the treatment.

Primary or recurrent apical periodontitis lesions mainly are caused by the microbial infection of the root canal system. Microorganisms invading and colonizing biological systems almost invariably live as members of metabolically integrated communities usually attached to surfaces to form biofilms (1). There is strong evidence today indicating that apical periodontitis is a biofilm-induced disease (2, 3). In the majority of cases, microbial biofilm infection from the main root canal also propagates to the extensions of the root canal system, including isthmuses, recesses, dentinal tubules, furcal canals, apical ramifications, and lateral canals (4).

Whether infection in lateral canals will cause a lateral periodontitis lesion with or without symptoms mostly will depend on the width of the canal and the size of the lateral foramen diameter adjacent to the periodontal area. The larger the lateral canal and the foramen diameter, the greater the chances of the infection to reach a magnitude sufficient to cause the expression of the host defense mechanism in the lateral periodontium (5). In small lateral canals, the amount of bacterial irritants with small volume capacity and small exiting foramen area might be insufficient to induce significant disease. Therefore, a lateral lesion usually indicates the presence of a large patent lateral canal with sufficient microbial burden to give rise to periodontal inflammation.

In cases of lateral periodontitis, the outcome of endodontic treatment is related directly to our ability to achieve infection control compatible with tissue healing (6). Two mechanisms are believed to be responsible for the genesis and growth of lateral periodontal lesions. The first suggests that lateral periodontitis lesions may appear and be sustained not by bacterial cells but rather by some bacterial products that diffuse through the patent dentinal tubules and reach the periodontal ligament (5). In these cases, removal of the bacterial content from the main canal should be enough to achieve infection control compatible with lateral lesion healing.

The second mechanism suggests that bacteria in the main root canal propagate and elicit inflammation in the tissue within the lateral canal. For these cases, it seems

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advisable that efforts should be made to apply therapeutic strategies to reach and incorporate these areas in the disinfection process (7).

The aim of the present article is to report the use of a recently described instrumentation approach for the management of a cone-beam computed tomography (CBCT)–discernible large lateral canal in an unusual maxillary central incisor with separate lateral and apical lesions.

Case Report

A 23-year-old female patient was referred for the evaluation and possible treatment of her maxillary left central incisor (tooth 9). The referral note was accompanied with a digital periapical radiograph of tooth 9 and a high-resolution CBCT scanning (VGi; NewTom, Verona, Italy). The accompanying CBCT parameters were as follows: first scout view (FSV) 110 V, FSV 5.28 mA, second scout view (SSV) 110 KV, SSV 12.48 mA, field of view 8 × 8 high resolution, and 5.4-second exposure time with an axial pitch and axial thickness of 0.150 mm. The accompanying periapical radiograph revealed a left maxillary central incisor with possible pulp chamber obliteration, unclear and complicated root anatomy, and rarefactions growing mesially and apically to the root (Fig. 1*A* and *B*). The CBCT examination confirmed the existence of the obliterated pulp chamber and verified the exact location and magnitude of the apical and lateral lesions. Moreover, it revealed a second independent root canal located palatal to the main root canal (Fig. 2*A*). Thorough examination of the enlarged axial slices revealed the point of entry to the pulp chamber (Fig. 2*B*), the buccal and palatal canals (Fig. 2*C* and *D*), and a possible lateral canal associated with the lateral rarefaction (arrows in Fig. 2*C* and *D*). The fact that the lateral canal was discernible in different axial slices and was located at the level of the lateral lesion suggested a true visualized canal trajectory rather than an artifact image.

The medical history was noncontributory. A 12-year-old subluxation dental trauma was reported. The patient was asymptomatic. The crown had a slight yellowish appearance. Periodontal probing was within normal limits. Thermal and electrical vitality testing were negative for tooth 9. A diagnosis of pulp necrosis and asymptomatic apical and lateral periodontitis was reached. A decision was made to initiate nonsurgical root canal treatment by giving special attention to the large, discernible lateral canal.

After buccal infiltration anesthesia and rubber dam placement, a palatal access cavity was prepared with a diamond bur. With the help of the CBCT, a palatal access cavity was initiated and directed towards the mesial pulp horn of the root canal system. After we accessed the pulp chamber, the mesiobuccal canal was negotiated easily (Fig. 2*B*). For the negotiation of the palatal canal, the access cavity was strategically

Figure 1. (*A*) Preoperative periapical radiograph, (*B*) pulp horn and buccal canal negotiation radiograph, (*C*) length determination radiograph for both main canals, (*D*) postobturation evaluation radiograph, (*E*) radiographic verification of lateral canal negotiation with an ISO 10k file, (*F*) lateral canal gutta-percha cone with sealer fitting radiograph, (*G*) postoperative periapical radiograph, and (*H*) 2-year follow-up radiograph.