

## CASE REPORT

# Maxillary Canine with Two Root Canals

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## ABSTRACT

Endodontic therapy is essentially a microneurologic surgical procedure involving complete debridement and three-dimensional (3D) obturation of the root canal system to obtain a fluid impervious seal. For effective and successful endodontic therapy, root canal morphology and variations should be considered. This case report will demonstrate a maxillary canine composed of two root canals which are completely separated and was confirmed using cone beam computed tomography; therefore, it will generate more precise understanding of anatomical variations of the maxillary canine.

**Keywords:** Maxillary canine, Root canal anatomy, Two root canals.

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## INTRODUCTION

The aim of endodontic treatment is elimination of infection from the root canal and prevention of re-infection.<sup>1</sup> The pulp canal system in any tooth has the potential of being very complex with branching and divisions throughout the length of the root. Lack of knowledge of pulp cavity anatomy and failure to negotiate and obturate the canal in its entirety is considered one of the main reasons and significant factor for failure of root canal therapy.<sup>2</sup> Therefore, a thorough knowledge of the root canal morphology and its variations is an indispensable prerequisite for the success of the root canal treatment.

Occasionally during the formation of a root, a break develops in Hertwig's epithelial root sheath producing a small gap. This results in "accessory canals" and can

be formed anywhere in the root, leading to periodontal-endodontic communication.<sup>3</sup> Vertucci classified the root canal configurations of human permanent teeth into various types ranging from single to three separate and distinct canals.

Canines are universally referred to as the "cornerstone" of the dental arches. Maxillary canines are considered to be single-rooted, single-canaled teeth.<sup>4</sup> It has been reported that 39% have straight canals, whereas 32% have root canals curved distally. Lateral canals are present in 30% cases. Two root canals in a permanent maxillary canine is a rare and unusual condition. Of those having two canals, majority join in apical third and exit at single apical foramen.<sup>5</sup> Variation of root canal morphology in the maxillary canine according to race has been reported in the Caucasian population as well as in Turkish, Saudi, and Indian population.

This case report will demonstrate a maxillary canine composed of two root canals which are completely separated; therefore, it will generate more precise understanding of anatomical variations of the maxillary canine.

## CASE REPORT

A 20-year-old male patient reported to the Department of Conservative Dentistry and Endodontics, with a chief complaint of pain in upper front region for the last 4 months. Subjective symptoms included dull, continuous, nonradiating pain that aggravated on mastication and relieved on medication. Past dental history and medical history were noncontributory.

Oral examination revealed deep dental caries extending subgingivally with direct pulpal exposure. Tooth was asymptomatic on palpation and tested negative using electric pulp tester. Periodontal status was within normal limits. Radiographic examination spotted abnormal root canal anatomy, single root with two root canals. Periapical radiolucency was seen with size less than 1 cm in diameter (Fig. 1). A cone beam computed tomography (CBCT) scan was taken with a 1 mm thick section. The sagittal plane image of the CBCT scan revealed the presence of an additional curved canal on the palatal side (Figs 2A and B). Provisional diagnosis made was chronic periapical abscess.

Endodontic treatment was started under local anesthesia. Access cavity was made using #1014 round diamond bur and endo-Z carbide bur, and pulp extirpation was done using barbed broach. Initially, one canal orifice was located. Orifice was not in the center of access (more labially). The

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second orifice was found by troughing with a low-speed small carbide round bur size #2 (3 mm) palatal to labial orifice. Root canals were negotiated with #10 K-file and working length was established (Fig. 3). The canals were cleaned and shaped to size #55 K-file with both buccal and

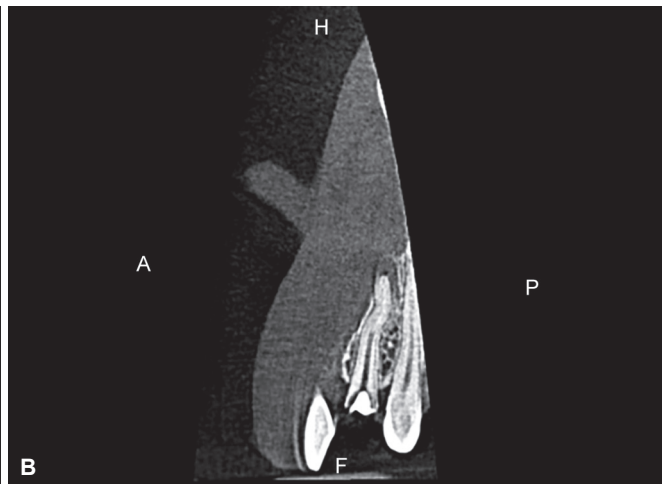
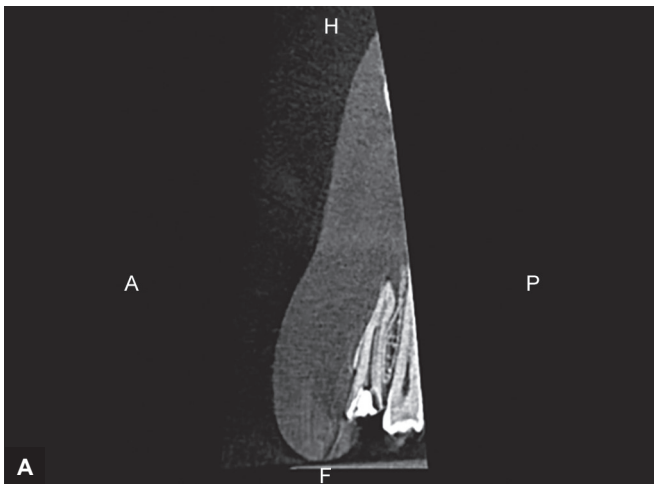
palatal canal in step back preparation. One milliliter of 5.25% NaOCl was used for irrigation between each instrument. After the final irrigation with 2% chlorhexidine, the canals were dried with paper points and master cone X-ray was taken (Fig. 4) and then canals were obturated with corresponding gutta-percha and AH Plus sealer using lateral compaction technique (Fig. 5). The patient was recalled after 1 week and found to be asymptomatic. As the tooth was grossly decayed, so post and core was planned. Post space was prepared in palatal canal (Fig. 6) and fiber post was cemented following composite core buildup (Fig. 7). Crown cutting was done followed by porcelain-fused-to-metal (PFM) crown cementation.

**DISCUSSION**

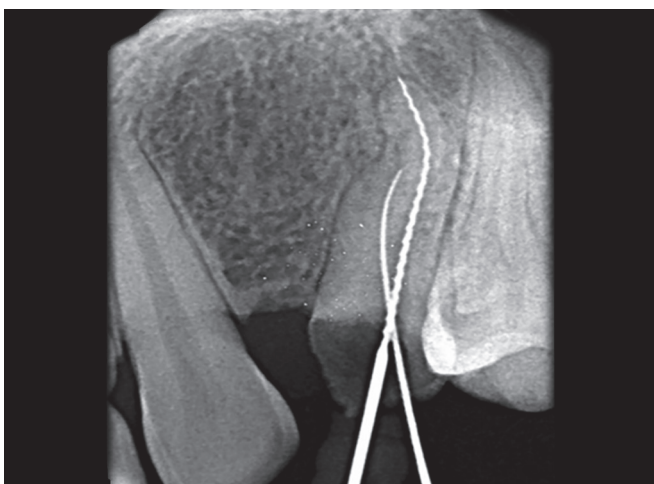
The objectives of root canal treatment are to debride the root canals of pulp tissue remnants, microorganisms, and bacterial products prior to obturation, thus inducing a favorable environment for healing of periradicular tissues. Failure to locate and fill a canal has been demonstrated to be a causative factor in the failure of nonsurgical



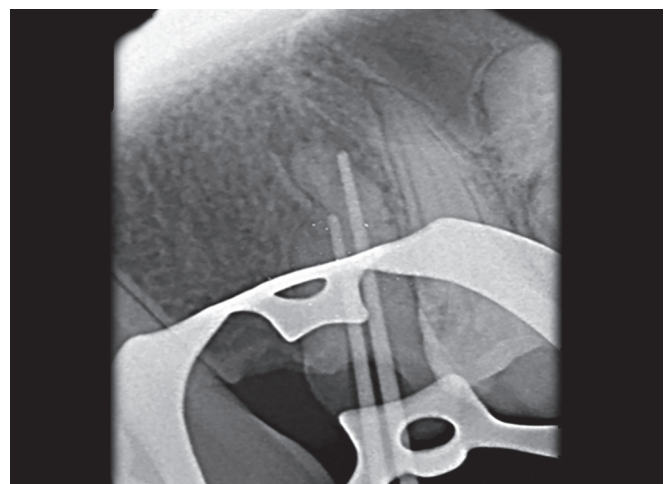
**Fig. 1:** Preoperative radiovisiograph



**Figs 2A and B:** Labial and palatal CBCT image



**Fig. 3:** Working length



**Fig. 4:** Master cone

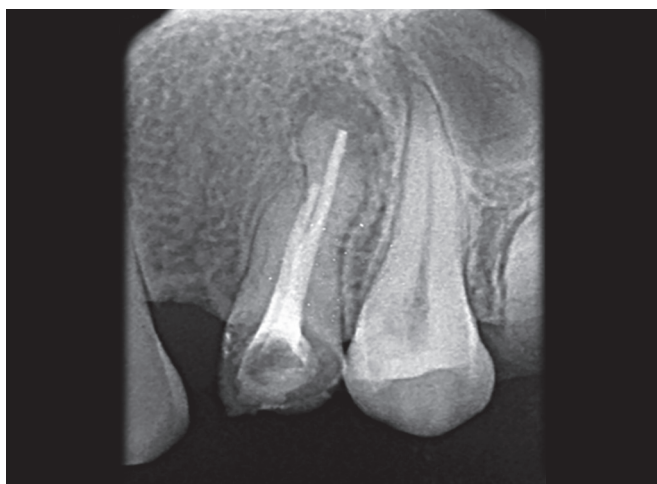


Fig. 5: Obturation



Fig. 6: Post space prepared in palatal canal



Fig. 7: Fiber post cemented with composite core buildup

endodontic therapy. It is of ultimate importance that all canals be located and managed during endodontic therapy.<sup>6</sup> Although the prevalence of the root canal anomalies is rare, they can be detected by careful examination. Most of the additional canals can be found if the clinician is alert to the clues that suggest their presence.<sup>7</sup>

During the last few years, there have been many studies of pulp morphology. The anatomical studies of Vertucci,<sup>5</sup> Pineda<sup>8</sup> and Kuttler Black, and Green all state that maxillary incisors have a single root 100% of the time. The percentage of permanent maxillary canines with type V canal configuration (one canal leaves the pulp chamber and divides short of the apex into two separate and distinct canals with separate apical foramina) was 2.17 and type III canal configuration (one canal leaves the pulp chamber, divides into two within the root, and merges to exit as one canal) was 4.35. There is a high incidence of fins, which run longitudinally within the walls of the canal and a network of communication between canals lying within the same root attributing to multiple root canals in single-rooted teeth. A review of the literature

revealed that Alapati et al<sup>9</sup> reported a maxillary right canine with type II canal configuration and Weisman reported a bi-rooted maxillary left canine.

Vertucci's classification (Vertucci's type II) was used for the classification of canal morphology in the present case report.<sup>5</sup> It is considered as a standardized method for categorizing root canal anatomical variations. In the present case two distinct root canal orifices were located in a labial/palatal configuration. Most of the previous published case reports were based on the radiographic examinations. One of the main limitation of radiographic image is a two-dimensional (2D) representation of three-dimensional (3D) objects.

Cone beam CT,<sup>10</sup> spiral (helical) CT,<sup>11</sup> and 3D Accutomo XYZ Slice View Tomography<sup>12</sup> are useful diagnostic methods to analyze the root canal morphology as well as an excellent tool in generating an informative image database. Finally, the report of this case using CBCT will increase the awareness of the clinicians and shed the light on anatomical variations in teeth morphology. It shows that special care is required to detect and treat possible additional canals.

## CONCLUSION

Clinicians should be aware of anatomical variations in the teeth they are managing, and should never assume that canal systems are simple. Even though the most common anatomy of maxillary canines comprises a single root and a single root canal, this report shows a case of the presence of a second canal in a single-rooted maxillary canine. If both root canals have not been appropriately treated during endodontic treatment, the necrotic tissue may remain after the treatment, and it may negatively affect prognosis. Therefore, to treat complete removal of any infection and prevention of re-infection, the clinician should be well aware of the possibility of anatomical variations in the root canal system.

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