Case Report

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Exploring the Uncommon: Case Report of Dual Canal Morphology in a Maxillary Canine

Abstract:
Accurate identification of root canal anatomy is crucial. Utilizing advanced imaging techniques like CBCT can reveal complex canal configurations that conventional radiographs might miss. The aim of this case report is to describe the case of a 50-year-old male patient who had a Vertucci's Type 2 classification in the permanent maxillary left canine, which was identified and successfully treated.

Key-words: Maxillary canine, anatomical variation, Double canals, Vertucci classification

Introduction:

A fundamental knowledge of canal morphology and its variations across different teeth is absolutely critical for the success of endodontic therapy. IOPARs are the first tool to identify these anatomic variations.Due to their two-dimensional nature, radiographs often fail to accurately show the true number of canals in teeth. CBCT has revolutionized the diagnosis and treatment in endodontics.[1]

Maxillary canines typically have a single, labiolingually wide canal (Vertucci's Type 1)[2] Typical variations include a single canal bifurcating into two and merging to one (Type 3) or two canals merging into one canal (Type 2)[3-12]. Inadequate radiographic assessment can leave bacteria and debris in unidentified canals, affecting treatment outcomes.[13] This case report presents a single-rooted maxillary canine with dual canals merging into one at the middle third.

Case Report:

A50-year-old Asian male patient visited the Department of Conservative Dentistry and Endodontics, Dr. Ziauddin Ahmad Dental College and Hospital, AMU, for treatment of his left maxillary canine. The patient complained of severe pain in the upper left front tooth region. There was no significant medical or dental history.Upon examination, the left maxillary canine presented with frank caries. There was tenderness on palpation and percussion. The initial pocket probing depth was within the normal limits and exhibited physiological mobility. The tooth gave a negative response on the sensibility test(both cold test and electric pulp vitality test).

Pre-operative radiograph showed irregular radiolucency in the distal surface of the crown approaching the pulp. A change in the density of the root canal was noted in the coronal third with two separate radiolucent lines running till the middle third, suspecting the presence of either two separate canals or a calcification [Figure 1].

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Fig. 1:Pre-operative radiograph showing a change in the density of root canal at the coronal third of the maxillary canine

Periapical pathology was noted on the apical region with a PAS 5.To understand the detailed morphology of the root canal system, a CBCT was advised. CBCT revealed the presence of two canals merging into one at the middle third [Figure 2].

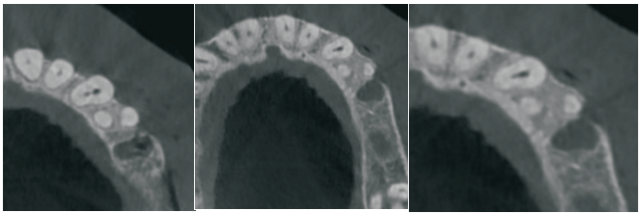

Fig. 2:Axial view of CBCT showing 2 canals at the coronal third;merging into 1 at the middle-apical third

Based on the clinical and radiographic findings, a definitive diagnosis of pulpal necrosis with symptomatic apical periodontitis w.r.t tooth #23 was formulated.[14]The patient was informed about the treatment plan, which included retaining the carious tooth through non-surgical root canal treatment followed by a restoration. An alternative option of extraction followed by a prosthesis was also given to the patient. A collective decision was made to retain the tooth.

On the first visit, local anaesthesia was administered with 2% lignocaine and 1:80,000 epinephrine, and the tooth was isolated with a medium thickness rubber dam(6*6 inches Latex Dental Dam, Sanctuary Health SDN BHD Chemor Perak, Malaysia). Access to the canals was gained with a round bur. Upon further refinement of the cavity with ultrasonics (Start-X 1,2,3,Dentsply Maillefer) and exploration with an endodontic explorer, the palatal canal was identified [Figure 3].

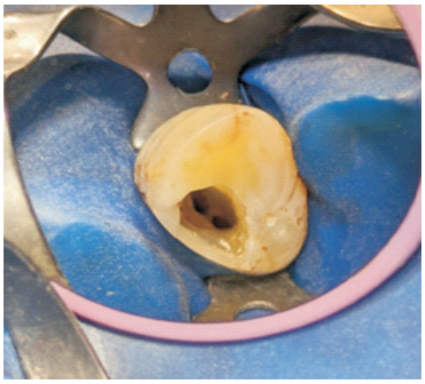

Fig. 3: Clinical photograph showing a buccal and a palatal canal in the maxillary canine

Working length was estimated using an electronic apex locator(Dentsply Maillefer) and confirmed with a radiograph by placing different-sized files in both canals,which revealed that both canals merged in the middle third (Vertucci's Type 2)[Figure 4].

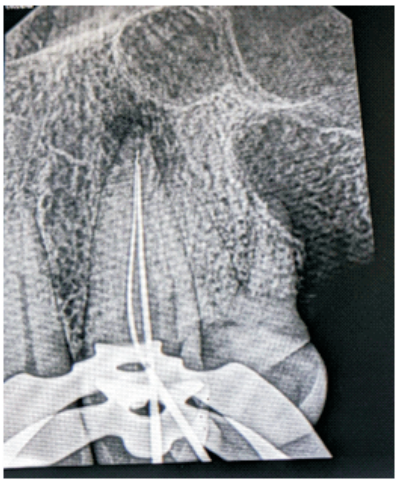

Fig 4:Working length radiograph showing 15k file in the buccal and 10k file in the palatal canal

The canals were negotiated and prepared with manual K files (sizes 8, 10, 15) and Hyflex CM(Coltene) files up to size 30-4%. The canals were recapitulated with smaller files in between and copious irrigation was performed throughout by sonic activation (Endo Activator, Dentsply Maillefer) with 3% sodium hypochlorite. Canals were dried with paper points, and intracanal medicament (RC Cal, Prime Dental Products, Mumbai, India) was placed. The tooth was temporarily restored (Cavit), and the patient was recalled after two weeks.

In the second visit, the patient was asymptomatic.The canals were irrigated with 1.5% sodium hypochlorite and then given a final rinse with normal saline.They were then dried with

paper points and obturated with gutta-percha points using cold lateral compaction and bioceramic sealer(BIO-C sealer, Angelus, Brazil [Figure 5,6].

Fig. 5: Radiograph showing master cone GP

Fig. 6: Post-obturation radiograph

Composite (Tetric-N-Ceram, Ivoclar)was used to permanently restore the tooth, and the restoration was finished and polished using discs(Shofu Inc.,Japan)[Figure 7].

Fig. 7:Photograph showing post-endodontic restoration with composite

A final radiograph was taken after post-endodontic restoration [Figure 8]. .After 3 weeks crown preparation was done and a PFM crown was given to the patient wrt tooth #23.[Figure 9

Fig. 8: Radiograph showing the final restoration

Figure 9: After crown placement

Discussion:

Knowledge about the normal and aberrant anatomy of individual teeth, along with their racial and demographic variations, is crucial. CBCT studies by Altunsoy et al. revealed that, in the Turkish population, the most prevalent canal configuration in maxillary anterior teeth was Vertucci's Type 1, occurring in 97.7% of cases, with only 0.4% showing Type 2.[3] In India, ex vivo studies[4] showed that 2.8% of 250 maxillary teeth had Vertucci's Type 2 configuration, and 3% of 100 maxillary and mandibular canines had Type 2 configuration[5]. Other in vivo studies reported a lower or negligible prevalence of Type 2 configuration[6,7,8–10].

IOPARs and RVG are the gold standard techniques for identifying extra canals. In the present case, a sudden change in the density of the pulp canal space indicated an extra canal or obstruction. In retreatment cases with a missed palatal canal, the gutta-percha may appear off-center within the canal[15].

According to the AAE and AAOMR Joint Position Statement, CBCT is recommended forthe identification of potential accessory canals in teeth with suspected complex morphology based on conventional imaging[16]. In this case, CBCT confirmed a second palatal canal and its patency, preventing complications like ledge formation and instrument separation. It also accurately located the canal orifice, found to be 1.5-2 mm palatal to the buccal canal.

In this case, the narrow palatal canal was located using magnification with dental loupes, ultrasonic tips, and exploration with a DG-16 explorer. Other methods for canal identification include the Champagne bubble test, dyes, transillumination, and the red or white line tests[17].

Biomechanical preparation enhances irrigation, crucial for removing microbes, necrotic tissue, and debris from root canals. Larger canal sizes improve cleanliness[18] and bacterial reduction[18,19]. In this case, both canals were enlarged to a size 30/4%,and irrigated using 3% sodium hypochlorite under sonic activation. The sonic activation created acoustic microstreaming, improving the effectiveness of the irrigant[20].

Obturation was performed using cold lateral condensation with an injectable bioceramic sealer. Bioceramic sealer has strong adhesion to dentin and gutta-percha, forms hydroxyapatite crystals in the presence of moisture,hence forming a chemical bond,creating a hermetic seal of the apical foramen, lateral, and accessory canals[21,22].

Conclusion:

This case report emphasises the significance of expecting variations in root canal configuration regardless of the type of tooth. All efforts should be made by the clinician to detect the existing canals through various clinical examinations and imaging modalities.

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