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Detection and management of missed and calcified fifth root in maxillary second molar using CBCT

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Abstract
Anatomical variations in maxillary molars can complicate endodontic treatment and lead to failure when additional canals remain undetected. This case report describes the management of a maxillary second molar with five roots and five canals in a 51-year-old male patient. Following initial treatment, the patient developed severe postoperative pain due to a missed canal. Re-access using ultrasonics under a dental operating microscope revealed a previously undetected second distobuccal (DB2) canal, which was successfully treated. Cone-beam computed tomography confirmed complete obturation. The patient remained asymptomatic at the six-month follow-up.

Keywords: Maxillary Second Molar, Five Roots, Missed canal, Ultrasonics, CBCT, Calcified canal

Introduction

The maxillary second molar (MSM) shows considerable anatomical variation and is often very challenging to manage endodontically because of the complexity of its root canal system. Most MSMs commonly present with three roots and three canals: mesiobuccal, distobuccal, and palatal [1]. However, the presence of additional roots has been reported, with the incidence of four-rooted maxillary second molars ranging from 0.98% to 5.6% [2]. Additional canals within the distobuccal or palatal roots are relatively rare and can be easily missed during routine treatment, potentially resulting in persistent infection, postoperative pain, and treatment failure [3].

The introduction of advanced diagnostic aids, such as the dental operating microscope, ultrasonics, and cone-beam computed tomography (CBCT), has greatly improved the clinician's ability to identify complex canal anatomy. Ultrasonics enable precise and conservative dentin removal, facilitating the detection of hidden canals, while magnification enlivens visualisation of the pulpal floor and increases the likelihood of locating additional canals [4].

Although variations involving multiple roots in maxillary molars have been described, the presence of five separate roots and canals in a maxillary second molar remains extremely rare, with only a limited number of cases reported in the literature [2], [5], [6] The identification of a missed distobuccal-2 (DB2) canal following initial treatment highlights the importance of careful exploration and the use of adjunctive technologies in modern endodontic practice.

The present case describes a maxillary second molar with five roots and canals in which a missed second distobuccal canal was subsequently identified using ultrasonics and a dental operating microscope. CBCT was used to assess the final root canal anatomy and quality of obturation.

Case report

A 51-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of pain in the upper right back tooth region since 5–6 days. The patient's medical history was non-contributory. Clinical examination showed deep occlusal caries in tooth 17, it was tender to vertical percussion with no mobility. Thermal and electric pulp testing indicated a vital pulp. Radiographic examination showed radiolucency involving the pulp space with tooth 17. Based on clinical and Radiographic findings, a diagnosis of symptomatic irreversible pulpitis with symptomatic apical periodontitis was made and non-surgical root canal treatment was planned.

After obtaining informed consent, caries excavation was performed under local anaesthesia with rubber dam isolation. During initial exploration, the mesiobuccal (MB), distobuccal-1 (DB1), and palatal-1 (P1) canals were identified. Continued exploration with a DG16 explorer revealed a second palatal canal (P2).

The canals were negotiated using ISO sizes 6, 8, and 10 K-files and working length was determined using an electronic apex locator and subsequently confirmed by radiograph. Cleaning and shaping were performed with HyFlex CM rotary instruments up to size 25/.04 using a lubricant. Irrigation was carried out with 3% sodium hypochlorite after each instrument change followed by final irrigation with 17% ethylenediaminetetraacetic acid (EDTA).

After drying the canals with sterile paper points, the master cone fit was checked radiographically. Obturation was carried out using the single-cone technique with gutta-percha cones and AH Plus sealer. The access cavity was restored with light-cured composite resin. A post-obturation radiograph confirmed well-obturated canals and no evidence of additional roots or canals was seen.

Three to four days after obturation, the patient returned with severe pain associated with tooth 17. A subsequent radiographic examination revealed an additional unobturated distal canal that had not been detected during the initial treatment. The possibility of missed canal was therefore considered.

The tooth was re-accessed under local anesthesia and rubber dam isolation. The access cavity was extended distally to improve visualization and exploration. Ultrasonic tips were used to trough calcified dentin in the distobuccal region and a second distobuccal canal (DB2) was successfully located and negotiated under 10× magnification using a dental operating microscope.

Working length of the newly identified canal was established using an electronic apex locator and confirmed radiographically. Cleaning and shaping of the newly identified canal were completed with HyFlex CM rotary files up to size 25/.04. Irrigation was performed with 3% sodium hypochlorite, followed by final irrigation with 17% EDTA. The canal was dried with paper points and obturated using gutta-percha and AH Plus sealer. Postoperative restoration was completed with composite resin and postoperative radiograph confirmed the obturation.

CBCT was performed subsequently to assess the root canal anatomy and verify the quality of obturation. The scan revealed five separate roots and canals, all of which were adequately obturated.

At the six-month follow-up examination, the patient remained asymptomatic, and the tooth remained functional.

Discussion

Successful endodontic treatment depends on the complete identification, cleaning, shaping, and obturation of the entire root canal system. Failure to detect additional canals is one of the most common causes of persistent postoperative pain and endodontic treatment failure. Adequate knowledge of root canal morphology and its variations is therefore essential for achieving successful outcomes [7].

The presence of five separate roots and canals in a maxillary second molar is extremely rare and presents a significant clinical challenge during endodontic treatment [2]. Such anatomical variations increase the risk of incomplete canal debridement if additional canals are not identified during the initial procedure.

In the present case involved five separate roots and canalsin a maxillary second molar which increased the possibility of missing the canals. In this patient, the second distobuccal canal was not identified initially and the patient developed severe postoperative pain. Further investigation demonstrated an untreated distal canal, prompting re-access and detailed exploration of the pulp floor [8].

Ultrasonics played a crucial role in the successful management of this case. Ultrasonic troughing enable precise and conservative dentin removal and facilitated the identification of hidden or calcified canals. This approach allowed the access refinement and minimised unnecessary removal of tooth structure [9].

Magnification significantly improves visualisation of the pulp chamber and root canal system and has been shown to increase the detection rate of additional canals compared with unaided vision [10]. In this case illustrates the importance of magnification in managing complex root canal anatomy.

CBCT provided and additional method of confirming the anatomy and verifying the quality of obturation, thereby improving diagnostic accuracy in complex endodontic cases.

The present case emphasizes the need to investigate when postoperative pain persists after root canal treatment. Careful examination of the pulpal floor combined with adjunctive technologies such as ultrasonics, magnification, and CBCT imaging can therefore assist in the management of teeth with complex root canal anatomy.

Figures

Fig 1: Preoperative radiograph

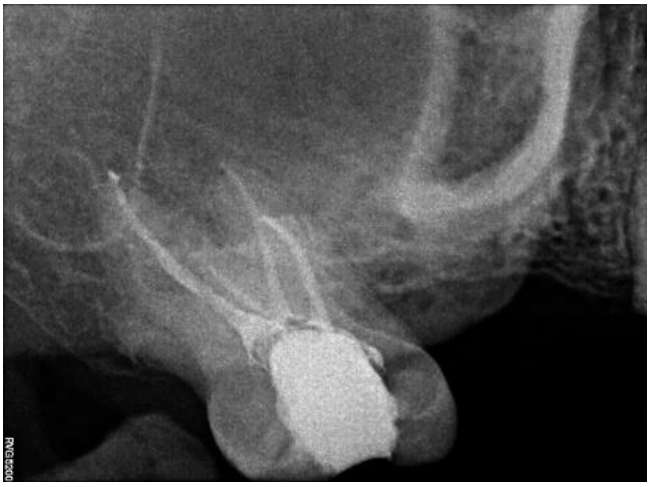

Fig 2: Radiograph Taken After Patient Returned With Pain

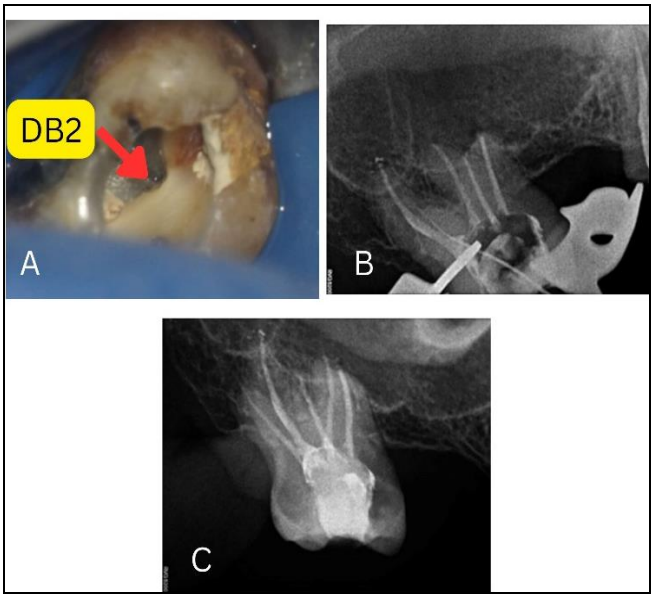

Fig 3: A. Location of DB2 canal, B. Working Length Radiograph of Newly Detected Canal (DB2) C. Final Obturation Radiograph

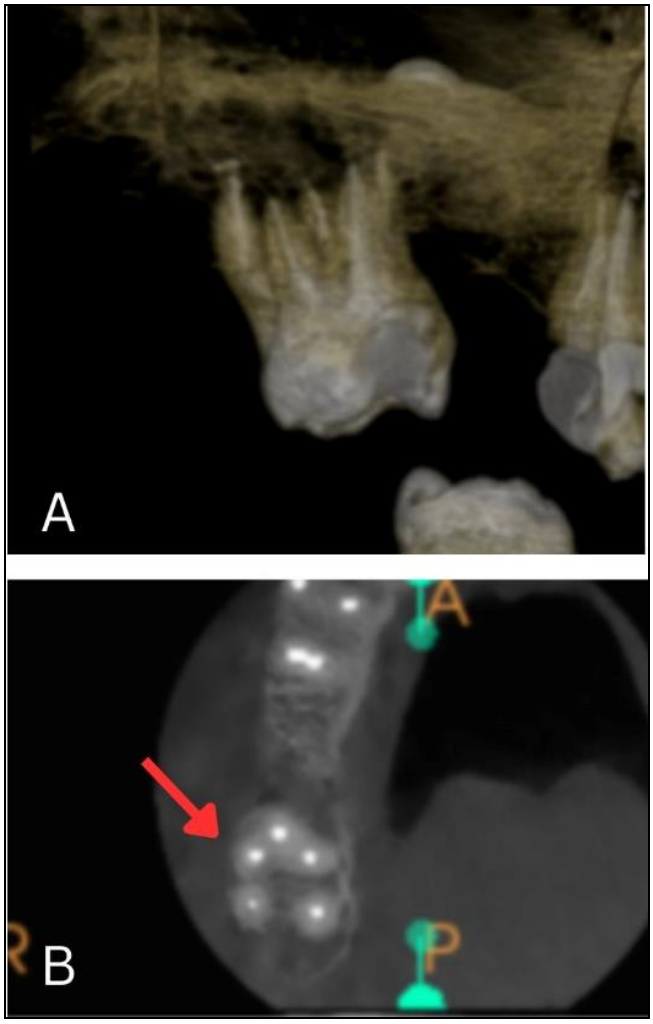

Fig 4: Cone-beam computed tomography (CBCT) images showing five separate roots

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