

Aberrant Canal Configuration of The Maxillary First Molar: A Case Report

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ABSTRACT

A clear understanding of the root morphology and canal anatomy is an essential prerequisite to achieve clean, disinfected and 3-dimensionally obturated root canal systems. Undetected extra roots or root canals can directly affect the outcome of

endodontic therapy. The purpose of this article was to present a clinical case of a maxillary first molar with two palatal canals in a single palatal root. This report serves in reminding clinicians that such anatomical variations should be taken into account during the endodontic treatment of the maxillary molars.

Key Words: Maxillary molar, Two palatal canal, Aberrant canal.

INTRODUCTION

Knowledge of both the normal and abnormal anatomies of the root canal system dictates the parameters for the execution of root canal therapy and this can directly affect the outcome of the endodontic therapy [1]. Many unusual canal configurations and anomalies in the maxillary first molars have been documented in case reports and several studies [2, 3]. The endodontic literature has demonstrated the maxillary first molar to be having 3 roots (the mesiobuccal, distobuccal and the palatal root) which form the “tripod” or “molar triangle”, with 3 or 4 root canals and the fourth canal commonly being MB2 [1,4-6]. Hence, the clinician needs to be familiar with both the eccentricities and the abnormalities in the root canal system [1].

In addition to these studies, the literature cites the variation in the palatal root of the maxillary molars as a single root with 2 separate orifices, 2 separate canals, and 2 separate foramina; 2 separate roots, each with 1 orifice, 1 canal, and 1 foramen; and a single root with 1 orifice, a bifurcated canal, and 2 separate foramen, with a trifurcation at the apical third in the palatal canal [7-10]. This case report describes the endodontic therapy of a permanent, maxillary, first molar with 2 canals in a single palatal root.

CASE REPORT

A 23-year-old male presented with pain in the right, maxillary, first molar of 2 months duration. The clinical examination revealed a deep carious lesion in the same tooth. The preoperative radiographical evaluation of the involved tooth indicated caries, which approximated the pulp with the normal root canal anatomy and the widening of the periodontal ligament space. The clinical and radiographic findings led to a diagnosis of apical periodontitis, for which non-surgical endodontic therapy was attempted. The patient's medical history was found to be non-contributory. The tooth was anaesthetized by using 2% lidocaine with 1:80,000 adrenaline (Lignox, Indoco Remedies Ltd, Mumbai, India). After isolation by using a rubber dam, an access cavity was established with a straight line access by using an access cavity bur (Dentsply Maillefer, Ballaigues, Switzerland).

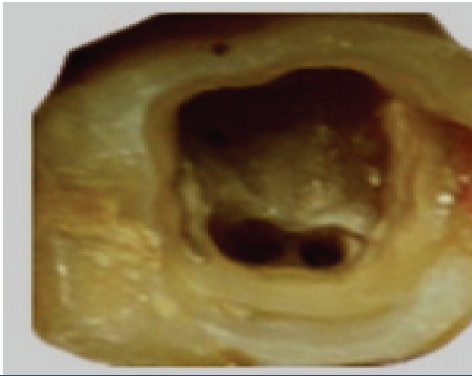
The clinical evaluation of the internal anatomy of the pulp chamber revealed 3 principal root canal orifices (the Mesio-Buccal the Disto-Buccal and the Palatal). The pulp chamber was frequently flushed with 5% sodium hypochlorite to remove the tissue debris. On probing with a HU-FRIEDY (Chicago,IL) DG-16 endodontic explorer, a stick was noted at the same orifice level, approximately 2 mm distally from the orifice of the main palatal canal. The access cavity was further modified. Inspection of the pulp chamber by using magnifying loupes (Seiler loupes, 2.5X magnification) revealed four distinct orifices, two buccal and two palatal [Table/ Fig 2]. The additional canal patency was checked by using a # 10 K- file (Mani ILC, Tochigi, Japan) . A working length radiograph confirmed the presence of two canals (Vertucci's type II) in the palatal root [Table/Fig 3]. All the canals were instrumented by the crown down technique by using protaper nickel- titanium rotary instruments (Maillefer Dentsply, Ballaigues, Switzerland) with 5% sodium hypochlorite solution and EDTA (Glyde, Maillefer, Dentsply). All the instrumented canals were medicated with Ca(OH)₂ and the tooth was temporized with IRM cement. After one week, the canals were obturated with an AH plus resin sealer (Dentsply, DeTrey Konstanz, Germany) and they were cold laterally condensed with gutta-percha (Maillefer, Dentsply, Tulsa, OK) and sealed with IRM cement. The post obturation radiograph revealed a Vertucci's type II root canal morphology in the palatal root [Table/Fig 4].

DISCUSSION

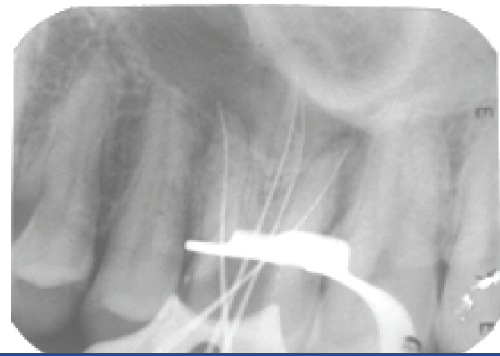
This case report emphasizes the importance of investigating the possibility of additional canals. Hess reported (1921) wide variations and the complexity of the root canal system, thus establishing that a root with a tapering canal and a single foramen was the exception rather than the rule¹. Based on the literature and this clinical case, it is evident that the knowledge about the anatomical variations of the maxillary molars is extremely important for the execution of a successful endodontic therapy. The incidence of an extra canal in the palatal root is not high, and it is reported to be 1-5% [7, 9, 11, 12].

The recommended clinical approach in the maxillary molars [15]—

- Radiographs are the “eyes” of the clinician and they are indispensable in most aspects of the endodontic practice [1]. Two diagnostic radiographs with parallel and mesial or distal



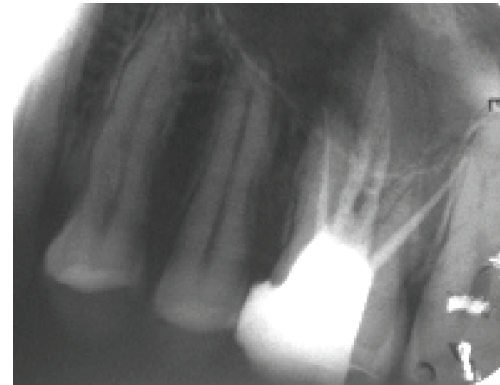
[Table/Fig-1]: Pre-op radiograph



[Table/Fig-3]: Working length



[Table/Fig-2]: Clinical view



[Table/Fig-4]: Post obturation radiograph

horizontal angles are always necessary to assess the anatomy and the number of roots of the maxillary molars.

- Since the shape of the pulp cavity is variable, making every treatment unique, adequate access should be ensured to improve the likelihood that additional canals will be located. An access cavity should be designed to provide direct access to the apical third of the root canal system, not merely to locate the canal orifice. It is also important for the access cavity to have smooth, externally diverging walls to improve the visibility and to prevent the debris from migrating into the canal system [13].
- The pulp chamber roof should be carefully removed and the chamber should be abundantly flushed with sodium hypochlorite.
- Following the dark developmental line on the pulp chamber floor with a DG16 endodontic probe, the orifices of the three main canals (MB1, DB, and palatal) should be located. The main canals should be negotiated and a working length radiograph should be taken on a distal projection, with the insertion of the #10 or #15 k-files. If the instrument appears to be off center in the root, a second canal should be suspected.
- The orifice of the MB2 canal should be localized with a DG16 probe and it should be negotiated by using an adequate file.
- A careful observation of the pulp chamber floor will offer clues to search for additional canal orifices. The effervescence of sodium hypochlorite on the pulp at the orifices of these extra canals may help in localizing them.
- Other aids such as troughing of the grooves with ultrasonic tips, staining the chamber floor with 1% methylene blue dye, visualizing the canal bleeding points, fiber-optic transillumination, the White line test, the Redline test, the Fast break guide line, Spiral Computed Tomography, etc, can be used to locate the extra canals.

- The high-power loupes and/or the operating microscope should be used with appropriate illumination in all the phases.

In the present case, the palatal root had two separate orifices with a single exit (Vertucci's type II), where 2 palatal canal orifices were found to be well-developed and large. The access outline was wider on the palatal aspect as compared to the usual width. The traditional triangular access opening - the MB, DB, and the palatal root which represented the apex of each point of the triangle - was often too constricted to allow a straight-line access in the maxillary molars [13]. Thomas and others [14] also warranted the use of a trapezoidal access cavity in the maxillary molars, right from their earlier studies. The treatment sequence and the prognosis for the molars with 2 palatal canals should be considered to be the same as those for any maxillary molar.

All the categories of teeth may have extra roots and/or canals, but the likelihood of finding aberrant canal configurations is higher in the molars [1,5]. Such variations also result from the ethnic background, age, gender, the source of the teeth, the study design, etc [1]. It has been postulated that the secondary dentin apposition during tooth maturation would form dentinal vertical partitions inside the root canal cavity, thus creating root canals [16].

The risk of missing the anatomy during root canal treatments is high due to the complexity of the root canal system [3]. The possibility of missing two canals in the palatal root further increases the possibility of errors during the treatment of the maxillary molars [15]. Hence, the clinician should always make every effort to find and treat various possible canal morphologies and not to precisely determine the actual number of root canals which are present.

CONCLUSION

The aetiology of endodontic failure is multifaceted, but the significant percentages are related to the inability in finding and properly treating the root canals. Therefore, the clinicians ought to

be aware of the complex root canal structures, the cross sectional dimensions and the iatrogenic alterations of the canal anatomy, together with the diagnosis and treatment planning, as the basic requirements for achieving a successful treatment outcome.

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