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RESEARCH ARTICLE

SEVEN ROOT CANALSIN PERMANENT MAXILLARY FIRST MOLARDECIPHERED BY CONE BEAM CT: A CASE REPORT

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ABSTRACT

The maxillary first permanent molar is the largest and most complex in its root canal morphology. The number of second mesio-buccal (MB-2) canals identified in maxillary molars increased from 51% in naked eye to 82% with microscopy. (Baldassari *et al*.,) This is a case report of endodontic treatment of a maxillary first permanent molar with 7 root canals identified by Cone Beam Computed Tomography and treated by root canal therapy using rotary instrumentation.

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INTRODUCTION

Complex variations in root canal morphologies have always posed a challenge to successful root canal therapy. The main objective of any root canal therapy is the elimination of bacteria from the infected root canal and the prevention of ensuing reinfection. This is primarilyachieved by thorough cleaning and shaping of the root canal, followed by three-dimensional filling with a fluid tight inert seal. Establishing adequate access for cleaning and shaping is an integral part of this procedure. In order to achieve these goals, the clinician must have a comprehensive insight and be well acquainted with the root canal anatomyand its possible anatomic diversities such as extra roots, extra canals, isthmusesetc. that may complicate the endodontic procedure. The presence of an untreated canal may be the reason for failure. Careful radiographic diagnosis plays a pivotal rolefor successful endodontic treatment of all the canals of the tooth.

CASE REPORT

A 12 year old boy reported to the Out Patient Department of Pedodontics and Preventive Dentistry of Gurunanak Institute of Dental Sciences and Research, Kolkata with the chief complaint of pain and decay of tooth in the upper left posterior region since past one month.

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History of present illness: Patient had pain in the upper left posterior region since the past 1 month. Pain was spontaneous, acute and throbbing in nature. Pain aggravated during mastication and at night or in supine posture and pain subsidedon medication only. Clinical examination revealed carious 26. No significant medical history was documented. On radiographic examination (Fig 1) radiolucency was seen involving the enamel, dentin and the pulpwith widening of periodontal ligament of 26. Taking into consideration the history and clinical and radiographic findings root canal treatment of 26 was advocated as the line of treatment. On the day of the first appointment an access cavity was prepared (Fig 2) and the pulp tissue was extirpated. Temporary Zinc oxide Eugenol restoration was done. On the second appointment the patient still complained of pain. Files were placed in the canals and radiographs were taken for working length determination when five canals were detected MB (1), MB (2), Palatal, disto-buccal and distolingual. Digital radiovisiographs were taken (to reduce radiation exposure) with different angulations and it was concluded that there were chances of more than five canals which were not clearly visible on radiographs or to the naked eye. Patient wasadviseda Cone Beam Computed Tomography for 26. Cone Beam CT (Fig 3) confirmed the presence of 7 Root Canals in 26 of which three canals were present in the palatal root, two in the mesial root and two in the distal root. As perVertucci's canal configuration Mesio-buccal root was Type 4 (2), Disto-buccal was Type 2 (2-1) and as per

Sert and Baryoli'sclassification the Palatal root had Type XV (3-2) canal configuration. Endodontic procedure was performed using XSmartendomotor (DentsplyMaillefer, Ballaigues, Switzerland). Canals were obturated using protaperGuttapercha points. Access cavity preparation was filled using Glass Ionomer Cement (GC, Fuji II). Stainless steel crown was cemented (Fig 7) using Glass Ionomer cement (Type I) after crown preparationand patient was recalled every three months for follow up.Post-operative CBCT Axial view (Fig 8) showed favourable obturation of all the canals. Upto one and half years follow up has been done. Tooth was clinically and radiographically (Fig 9) asymptomatic even at the last follow up.

Figure 1. Pre-treatment IOPAR

Figure 2. Access cavity showing canal orifices

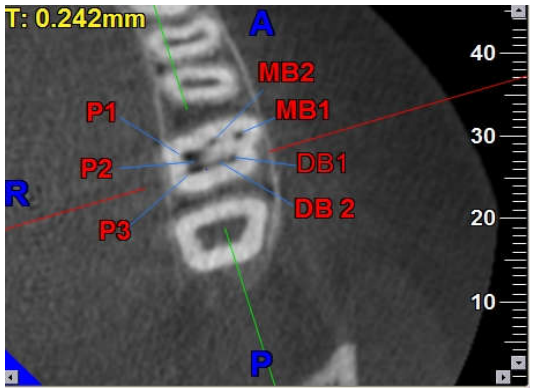

Figure 3. CBCT report showing 7 canals

DISCUSSION

Radiographs taken at different angulations help to detect any aberrant anatomy such as extra canals/roots (De Moor, 2004). However, a significant constraint in conventional radiography is that it produces a two-dimensional representation of a three-dimensional substance, causing superimposition of the overlying structures.

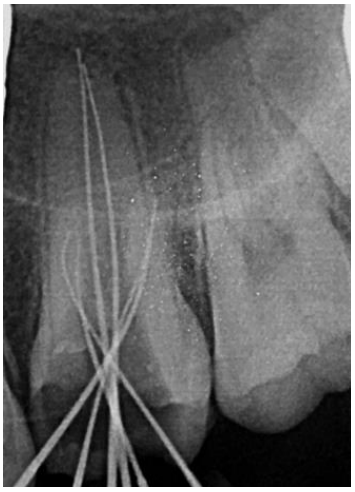

Figure 4. Working length measurements

Figure 5. Master cone (Trial RVG)

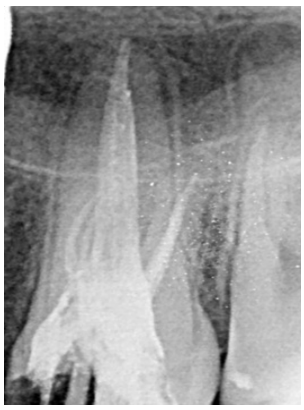

Figure 6. Obturation

Figure 7. Per- treatment radio visio-graphy of Stainless steel crown placement

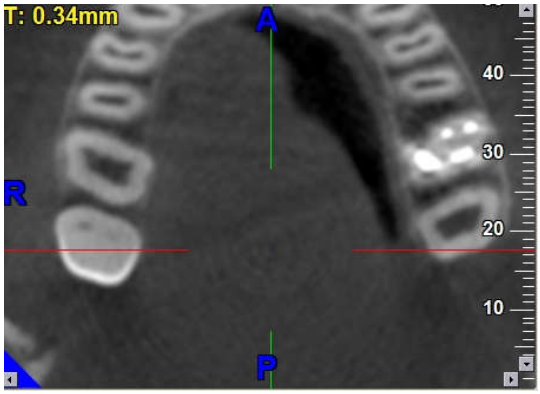

Figure 8. Post operative Axial CBCT scan showing obturation (Due to close proximation of canals overlapping in radioopacity seen)

Figure 9. 1 year postoperative IOPAR

To achieve a more detailed comprehension of the morphological architecture of the root canals and their accord, progress towards more unconventional diagnostic tools is needed. Recently, cone-beam computed tomography (CBCT) has emerged as a useful aid in the diagnosis teeth with complex root canal anatomies (Gopikrishna, 2008). It is an imaging method employing tomography to generate a three-dimensional stratified representation of the entire tooth from a single imaging procedure. The expediencies of CBCT imaging include complete elimination of superimposition of structural images outside the area of interest and high-contrast resolution and data compiled from a solitary computed tomography imaging process. Moreover, the images can be viewed in a coronal, sagittal, or even an oblique or curved image planes—the modus operandi is referred to as Multi-planar Reformation (MPR). In addition, CBCT data is amenable to reformation in a volume as well as slices, providing 3-D images in the axial, coronal, or sagittal planes (Kirzioglu, 2007).

The root canal anatomy of maxillary first molars has been described as three roots with three canals, and the commonest variation is the presence of a second mesiobuccal canal. The incidence of second mesiobuccal canal has been reported to be between 18% and 96.1% (Kulild, 1990). Case reports with five and six root canals or with a C-shaped canal configuration have also been reported. Almeida *et al*. (2009) reported six root canals with two mesiobuccal, two distobuccal, and two palatal root canals. Maggiore *et al* (2002) reported a maxillary first molar having six canals with two mesiobuccal, three palatal, and one distobuccal, whereas Adanir 2007) reported an in vivo case having four roots (palatal, mesiobuccal, mesiopalatal and distobuccal) and six canals with one mesiobuccal, two mesiopalatal, two distobuccal, and one palatal. 2% to 5.1% incidence of two rootcanals in the palatal root of maxillary molars has been reported (Stone, 1981). Of the various comprehensive maxillary first molar ex vivo studies in the dental literature referred by us, only BarattoFilho *et al*. (2009) had reported a maxillary first molar with three roots and seven root canals. Among the 140 extracted maxillary firstmolars analysed by Filho *et al*, only one tooth had seven root canals of which three were identified as mesiobuccal canals, three distobuccal canals, and one palatal canal. The present case report discusses the successful endodontic management of a permanent maxillary first molar presenting with seven root canals distributed in three roots. This unusual morphology was reaffirmed with the guidance of cone beam computerized tomography (CBCT) scans.

Conclusion

This is a case of endodontic treatment of a maxillary first permanent molar with three roots and 7 root canals in a 12 year old male patient. Mesial root had Type II (2-1) canal, Distal root had Type IV (2) root canal morphology as per Vertucci's classification. Palatal root had Type XV (3-2) canal system as per Sert and Bayirli's additional canal types to Vertucci's classification. Cone beam Computed tomography played an instrumental role in deciphering the root canal morphology as it was beyond the scope of other available methods. Thus, CBCT as an advanced diagnostic tool definitely increases the success rate of endodontic treatments by clarifying the picture of complex root canal morphologies.

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