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ENDODONTIC MANAGEMENT OF MAXILLARY SECOND MOLAR HAVING MB2 CANAL: A CASE REPORT

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ABSTRACT:

The main objective of root canal treatment is to relieve pain, disinfect root canal and prevent reinfection. To achieve clean, disinfected and 3-dimensionally obturated root canals, clear knowledge of root morphology and canal anatomy is essential. Awareness and understanding of the presence of unusual external and internal root canal morphology contributes to successful outcome of the root canal treatment. Maxillary second molars show considerable anatomic variation and abnormalities with respect to the number of roots and root canals. Undetected extra roots or root canals are a major reason for failure of root canal treatment. Presence of a second canal in mesiobuccal root (MB2) of maxillary molars is well documented in the literature. Various studies have shown that occurrence of MB2 root canal is found to be more in maxillary first molars than maxillary second molars. Accurate radiographic technique and proper interpretation are essential for sound diagnosis and treatment. The use of preoperative radiographs at di?erent angles helps to detect and evaluate root canal morphology and anatomy. CBCT is a method of choice to visualize extra number of roots and root canals. Other devices like magnifying loupes and dental operating microscope can also be used to detect extra canals

Keywords: Mesiobuccal Root, CBCT, Maxillary Molar

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INTRODUCTION

To achieve clean, disinfected, and 3-dimensionally obturated root canal systems, clear knowledge of the root morphology and canal anatomy is essential[1].Awareness and understanding of the presence of unusual external and internal root canal morphology contributes to the successful outcome of the root canal treatment. Maxillary second molars show considerable anatomic variation and abnormalities with respect to the number of roots and root canals. Traditionally, the maxillary second molar has been described to have 3 roots with 3 or 4 root canals, with the fourth canal commonly being found in the mesiobuccal root (MB2)[2]. Undetected extra roots or root canals are a major reason for failure of root canal treatment[2]. Weine stated that one of the reasons for the failure of endodontic treatment of maxillary molars is due to the failure to locate and fill the second mesiobuccal canal[4]. Unusual canal anatomy associated with the maxillary molars has been investigated in several studies[1]. Pecora studied the internal anatomy of 370 maxillary molars by clearing the roof of the pulp chamber and located a second canal in mesiobuccal root of maxillary second molars, with frequency of 42%. Stropko examined 611 maxillary second molars over a period of eight years. He found an incidence of MB2 canals present in 310 (50.7%) cases. It occurred as a separate canal in 119 (45.6%) cases and joined the MB1 in 142 (54.4%) cases.

Schwarze, confirmed in his study that there was a high number of second canals in the mesiobuccal roots (i.e.) 48% of maxillary second molars[2]. Accurate radiographic technique and proper interpretation are essential for sound diagnosis and treatment. The use of preoperative radiographs at di?erent angles helps to detect and evaluate root canal morphology and anatomy[1]. CBCT is a method of choice to visualize the number of roots. The improved detection of the root canals should mean that more of the complex root canal is accessed, disinfected, and filled, which in turn improve the outcome of root canal treatment[3]. The purpose of this article is to present case report of maxillary second molar, in which an extra canal in the mesiobuccal root was located using visual and magnifying devices, which

was later confirmed by CBCT, followed by endodontic treatment.

Case report

A 27-year-old male was referred to Department of Conservative Dentistry and Endodontics for pain on chewing in upper left back tooth region of mouth since 5 days. There was no history of swelling. On clinical examination a large carious lesion on the occlusal surface of maxillary left second molar was observed (fig 1). Tooth was tender on percussion. Response to vitality test was delayed positive. On radiographic examination large carious lesion extending from occlusal surface towards pulp was observed along with widening of periodontal ligament space. So, a diagnosis of symptomatic acute periapical periodontitis was made with respect to maxillary left second molar. Medical history was noncontributing. So, it was decided to initiate root canal therapy followed by restoration. The tooth was anesthetized with 2% lidocaine with 1:100,000 epinephrine, and root canal therapy was initiated under rubber dam isolation. Access to the pulp chamber was achieved using a round diamond bur (no. 4; MANI Inc., Tochigi-ken, Japan). Once the pulp chamber was deroofed, a trapezoidal shaped access opening was obtained. On careful visualisation of the pulp chamber floor, it showed the presence of a long groove following the dentinal map. Further examination and exploration with DG 16 endodontic explorer disclosed an extra mesiobuccal canal around 2mm away, in the mesial and palatal direction (fig 2). Working length was established with the help of an apex locator (Root ZX, J.Morita Inc.:USA) and confirmed by periapical radiographs (fig 3). The access cavity was then sealed with IRM cement. CBCT imaging was done to confirm the presence of 2 mesiobuccal canals (fig 4,5). In the second appointment canals were cleaned and shaped with hand files and Rotory Protaper Gold (Dentsply/Maillefer, Ballaigues, Switzerland) in a crown down manner upto final canal size F1 in MB1and MB2, F2 in distobuccal canal and palatal canal along with copious irrigation with 5 ml of 3 % NaOCl and 5 ml of saline used alternatively after each instrumentation. Calcium hydroxide dressing was given and the access cavity was sealed with IRM cement and patient was recalled after 1 week. In third appointment, calcium was removed from the canals and final irrigation was done with 17% EDTA. Canals were dried using paper points and a master cone radiograph was taken to check the apical fit in all the four canals (fig 6). Finally canals were obturated with gutta percha and AH plus sealer (Dentsply, Detrey, Konstaz,Germany) using warm vertical compaction. The access preparation was sealed and the post endodontic restoration was done with composite (fig 7). Patient was advised to get a prosthetic crown over the tooth. Patient was recalled for follow up after 1 week.

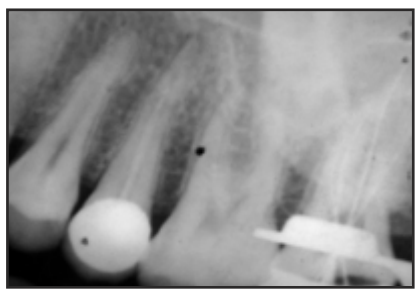
Discussion

Varied percentages of patients with a second mesiobuccal canal in the maxillary second molar are 24% by Sempira and Hartwell and 93.7% by Kulild and Peter[5]. Probably because of better visualization using CBCT, studies by Alrahabi and Sohail Zafar and Lee et al. have mentioned the increased incidence of two canals in the mesiobuccal root[7]. An inability to locate MB2 root canal in mesiobuccal root of maxillary molars may be a major cause of failure of root canal treatment. According to James Wolcott et al 35% of maxillary 2nd molars had MB2 canal compared to 60% of maxillary 1st molars[5]. The openings of MB2 canals are localized on an imaginary line between MB1 and palatal orifice[6].

The methods to explore additional canal orifices have always been an important area of discussion and various tools have been used for this[7].

Pre- operative radiograph (Fig 1)

View under operating microscope showing 4 canal orifices (Fig 2)



Working length radiograph (Fig 3)

Spiral CT scan- coronal section showing 2 mesial canals (Fig 4)

Spiral CT scan-saggital sections showing 2 mesial canals (Fig 5)

Master cone radiograph (Fig 6)

Post obturation radiograph (Fig 7)

Magnifying loupes, CBCT and surgical operating microscope

Examination of the pulp chamber floor with sharp explorer, performing sodium hypochlorite "champagne bubble test," and visualizing canal bleeding points are the commonly followed methods for detection of canal orifices.

Beer and Baumann suggested a geometric aid to locate an extra canal, which is adopted in this study to locate the extra canal. First a line 1 was drawn connecting mesiobuccal and palatal canals, then a line 2 was drawn perpendicular to line 1, at a point one third the intercanal distance from the palatal canal such that this line passes over the distobuccal canal. A fourth canal lies somewhere along line 3, which deviates approximately 10°.The MB2 canal has a marked incline immediately apical to its orifice in coronal 1-3 mm. When an attempt is made to instrument MB2, the tip of the file tends to catch against mesial wall of the canal, preventing apical progress. This is because MB2 canal is smaller and usually narrower than MB1[8]. After locating the MB2 orifice, the "refinement" of access preparation, is desired to get a straight line access to the canal. Sometimes, MB2 lies in same orifice as MB1[8]. Most of the MB2 canals, however, can be best identified by means of an operating microscope[10]. It was found that 33.3% of cases with MB2 was identified using 3.5 X magnifying loupe, whereas 95.8% were identified using an operating microscope[4].

Dental Operating Microscopes (DOM) improve light and magnification in operating field, thereby increasing ability to locate missed canals and decreasing the risk of procedural errors. Consequently, DOM should be considered as an important aid in contemporary endodontic practice[10]. Baratto Filho et al evaluated internal morphology of maxillary first molar using operating microscope and CBCT scanning. He concluded that operating microscope and CBCT scanning were important for locating and identifying root canals[10].

In this study, CBCT was done to take advantages of good resolution and three-dimensional presentation[9]. Amount of information gained from conventional radiographs and digital periapical radiographs is limited by the fact that three-dimensional anatomy is compressed into a two-dimensional image[10]. The major advantages of CBCT scanning over conventional CT scans are x-ray beam limitation, rapid scan time and effective dose reduction. X-ray beam limitation is achieved by reducing the size of irradiated area by collimation of primary x-ray beam to area of interest. Rapid scan time (10-70 seconds) is because of its ability to acquire the whole three-dimensional volume of data in a single rotation[10]. The main disadvantage of CBCT scanning is limitation to major metropolitan areas and is very expensive.

Matherne et al investigated use of CBCT scanning in identifying root canal systems he concluded that CBCT images always resulted in the identification of greater number of root canal than digital images[10].

Conclusion

Varying morphology in human teeth is a common occurrence. Thorough knowledge of these variations is essential prior to initiation of endodontic therapy. This report also highlights the role of surgical operating microscope and CBCT scanning as an objective analytic tool to ascertain root canal morphology. Hence, the endodontist must have an open mind to accept the possibilities of extra canals for better management and a successful treatment outcome.

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