

Endodontic Management Of Maxillary Molars With Aberrant Anatomy - A Case Series

Research Article

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Abstract

The presence of multiple root canals in maxillary molars is not completely unexpected. It is extremely essential for clinicians to be able to gauge their presence and locate them successfully as the consequences of missing root canals are pretty grave. Clinical as well as radiographic analysis of a tooth must be done proactively in order to avoid missing additional root canals. This case series emphasises the use of clinical as well as radiographic advances in the endodontic management of maxillary first molar teeth with aberrant anatomy.

Keywords: Aberrant; CBCT; Dental Operating Microscope; Endodontics; Root canals; Ultrasonics.

Introduction

The knowledge and being able to visualise the internal anatomy of a tooth are essential prerequisites for initiating endodontic therapy of a tooth [1]. An endodontic therapy is the treatment of choice when the pulpal or periapical tissues are inflamed or infected [2]. The successful location of all root canals not just eases the patient's pain or discomfort but also radically increases the success rates of the endodontic therapy. Adequate cleaning and shaping of the canal space so that it is able to receive a three dimensional seal is imperative of endodontic therapy [3]. Inadequate knowledge of the root canal anatomy poses a difficulty for clinicians. It is thus necessary to take radiographs in multiple angulations [4]. The nature of root canals may not be identical all the time and can present with a wide array of variations. Maxillary molars usually present with 3 roots. The incidence of MB2 in maxillary molars range from 18-96% [5]. The incidence of five canals is reported to be 2.25-2.4% and the incidence of six canals is reported to be 0.319 - 0.88% [6, 7]. The incidence of a second palatal canal is also reported in the range of 2.05%, 0.65%, 4.55%

cases on ex vivo, clinical and computed tomography respectively [8].

Previously our team has a rich experience in working on various research projects across multiple disciplines [9-23]. Now the growing trend in this area motivated us to pursue this project.

The current case series presents three cases with aberrant anatomy present in maxillary first molars which were endodontically treated under magnification.

Case 1

An 18-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a complaint of continuous pain in an upper right posterior tooth since a week. The patient gave a history of intermittent pain on mastication in that tooth since the past three months. On clinical examination, the maxillary right first molar had deep dentinal occlusal decay and was tender on percussion. Vitality testing of the involved tooth

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Figure 1. Case 1 preoperative radiograph.**Figure 2. Case 1 working length radiograph.****Figure 3. Case 1 Access cavity preparation.****Figure 4. Case 1 obturation.****Figure 5. Case 2 preoperative radiograph.****Figure 6. Case 2 working length radiograph.**

with heated gutta-percha and electric pulp test gave no response. The preoperative radiograph (Fig No.1) showed radiolucency involving enamel, dentin and pulp with widening of periodontal ligament space. From the history, clinical findings and radiographic interpretation, a diagnosis of symptomatic apical periodontitis in the maxillary right first molar was made. Non surgical endodontic therapy was recommended and patient's consent was obtained.

Local anesthesia was given and caries excavation was done under rubber dam isolation. A conventional access cavity preparation was done and a pulp stone from the chamber was removed using ultrasonics. Initially, MB1, MB2, DB and Palatal canals were located. Under careful observation using DOM (Carl Zeiss), a second palatal canal was located and confirmed using radiograph. The working lengths were determined with the help of an apex

locator (Root ZX Mini, J Morita, Tokyo, Japan) and intraoral peri-apical radiographs. Cleaning and shaping were performed using nickel–titanium rotary instruments (ProTaper Gold, Dentsply VDW, Germany) using the crown-down technique. During the biomechanical preparation of the root canals, 2.5% Sodium hypochlorite was used as the irrigant. Final rinsing of the canals was done with 2% Chlorhexidine Gluconate (Asep RC, Stedman Anabond, Chennai, India). The canals were washed with saline, dried using paper points and obturated with gutta percha and AH Plus sealer (Dentsply Maillefer, Ballaigues, Switzerland) using the lateral compaction technique. A radiograph to evaluate the quality of the obturation was taken and restored with composite resin. The patient is completely asymptomatic at a follow up of 6 months.

Case 2

A 37-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a complaint of moderate pain in the upper right posterior region since a week. The patient gave a history of intermittent pain on mastication in that tooth since the past three months. On clinical examination, the maxillary right first molar had mesio-proximal caries and was tender on percussion. Vitality testing of the involved tooth with heated gutta-percha and electric pulp test gave an exaggerated response. The preoperative radiograph showed radiolucency involving enamel, dentin and pulp with widening of periodontal liga-

ment space. From the history, clinical findings and radiographic interpretation, a diagnosis of symptomatic irreversible pulpitis with symptomatic apical periodontitis in the maxillary right first molar was made. Non surgical endodontic therapy was recommended and patient's consent was obtained. Local anesthesia was given followed by caries excavation and restoration of the mesial surface of the tooth using composite resin such that isolation using rubber dam could be made effortlessly. The entire procedure was performed under rubber dam isolation. A conventional access cavity preparation was done and a pulp stone from the chamber was removed using ultrasonics. 5 canals namely; MB1, MB2, DB, MP and DP were located using DOM (Carl Zeiss). The working lengths were determined with the help of an apex locator (Root ZX Mini, J Morita, Tokyo, Japan) and intraoral peri-apical radiographs. Cleaning and shaping were performed using nickel-titanium rotary instruments (ProTaper Gold, Dentsply VDW, Germany) using the crown-down technique. During the biomechanical preparation of the root canals, 2.5% Sodium hypochlorite was used as the irrigant. Final rinsing of the canals was done with 2% Chlorhexidine Gluconate (Asep RC, Stedman Anabond, Chennai, India). The canals were washed with saline, dried using paper points and obturated with gutta percha and AH Plus sealer (Dentsply Maillefer, Ballaigues, Switzerland) using the lateral compaction technique. A radiograph to evaluate the quality of the obturation was taken and restored with composite resin. The patient is completely asymptomatic at a follow up of 6 months.

Figure 7. Case 2 Access cavity preparation.

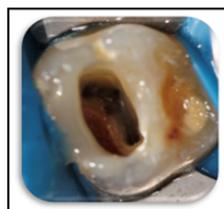


Figure 8. Case 2 obturation.



Figure 9. Case 3 preoperative radiograph.



Figure 10. Case 3 CBCT showing 6 root canals.

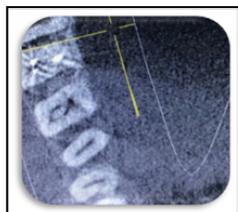
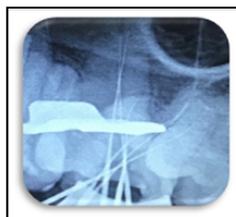
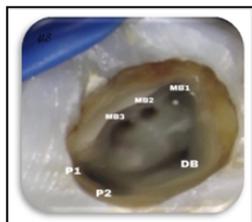


Figure 11. Case 3 working length radiograph.**Figure 12. Case 3 Access cavity preparation.****Figure 13. Case 3 Access cavity preparation.**

Case 3

A 26-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a complaint of intermittent pain in an upper right posterior tooth since a week. The patient gave a history of a previous restoration done by a general dentist. On clinical examination, the maxillary right first molar had a composite restoration. Vitality testing of the involved tooth with heated gutta-percha and electric pulp test gave early response. The preoperative radiograph showed radiolucency involving enamel, dentin and approaching pulp with slight widening of periodontal ligament space. From the history, clinical findings and radiographic interpretation, a diagnosis of symptomatic irreversible pulpitis in the maxillary right first molar was made. Non surgical endodontic therapy was recommended and patient's consent was obtained. Local anesthesia was given and caries excavation was done under rubber dam isolation. A conventional access cavity preparation was done and a pulp stone from the chamber was removed using ultrasonics. Initially, MB1, MB2, DB and Palatal canals were located. Further careful observation using DOM (Carl Zeiss), a third MB canal orifice and second palatal canals were located and confirmed using radiograph. To confirm the presence of extra canals, it was decided to take up a CBCT scan. CBCT confirmed the presence of 6 root canals namely MB1, MB2, MB3, DB, P1 and P2. The working lengths were determined with the help of an apex locator (Root ZX Mini, J Morita, Tokyo, Japan) and intraoral periapical radiographs. Cleaning and shaping were performed using nickel-titanium rotary instruments (ProTaper Gold, Dentsply VDW, Germany) using the crown-down technique. During the biomechanical preparation of the root canals, 2.5% Sodium hypochlorite was used as the irrigant. Final rinsing of the canals was done with 2% Chlorhexidine Gluconate (Asep RC, Stedman Ana-

bond, Chennai, India). The canals were washed with saline, dried using paper points and obturated with gutta percha and AH Plus sealer (Dentsply Maillefer, Ballaigues, Switzerland) using the lateral compaction technique. A radiograph to evaluate the quality of the obturation was taken and restored with composite resin. The patient is completely asymptomatic at a follow up of 6 months.

Discussion

Our institution is passionate about high quality evidence based research and has excelled in various fields [24-34].

The internal anatomy of the maxillary first molar can be obscure. It is evident that the internal anatomy consists of fins, lateral and accessory canals, multiple openings and isthmus. Also, the canal openings can be oval or round. All these complexities along with extra canals pose difficulties in the endodontic management of maxillary molars. Preoperative IOPA radiographs with different angulations are hence of great help in determining aberrant root and canal morphology [35]. Diagnosis of extra canals and roots by the aid of multiple angulated radiographs is now an older entity. However, diagnosis of extra canals and roots may be difficult because of their relatively smaller dimensions and super imposition as a result of the 2D imaging modalities. With the introduction of CBCT in endodontics, the canal configuration can be visualised 3 dimensionally and confirmed efficiently [36].

In the current case series, the palatal canals in all the three cases represent Vertucci's Type II. The MB1 and MB2 canals in case 1 can be represented by Vertucci's Type IV while in case 2 the canal configuration can be represented by Vertucci's Type II. The MB1, MB2 and MB3 canals in Case 3 can be represented by Sert and Bayirli's classification Type XV. In the current case, the MB3 canal

had a completely separate course and did not fuse with MB1 or MB2. This is the first case where this type of configuration of MB canals can be seen. The location of the MB3 orifice was on a crevice 1mm beneath the pulpal floor that joined MB2 and MP canals. A few cases that reported with 6 root canals and the presence of MB3 canal were by Du Y et al 2011, Kaushik et al 2013, Bhamidi et al 2014, Habboubi et al 2016, Kishan et al 2018 and Agrawal et al 2019 [37-41]. The configurations of the MB roots in the above mentioned cases presented with Vertucci's Type VIII and Sert and Bayirli's Type XII and XVIII configurations.

There have been a few of the previously reported cases and published Indian literature with the presence of 6 root canals in maxillary first molar [37, 38, 40-45]. Variety of presentations in maxillary molars with 6 canals can be appreciated. 3MB, 2DB, 1P; 2 MB, 2 DB, 2P and 3MB, 1DB, 2P have been reported. The case of 6 root canals in the current case series presented with canal distribution as reported in the following cases [37, 40]. It is evident from the literature search that the reported incidence of 6 canals or above in Indian population is comparatively higher than others. Hence, clinicians must spend some time evaluating the preoperative IOPA radiographs and the access cavities and use modern equipment for searching through the tooth for extra canals.

The importance of DOM cannot be disregarded. DOM increases the efficiency of the operator to locate extra canals [46]. The learning curve while using DOM is extremely tedious and long, however the end results are fruitful.

Various authors have suggested methods that aid in locating extra canals. Multiple angulated radiographs (at least three offset horizontal angulations), appropriate use of computed tomography (CT), use of magnification (either dental loupes or dental operating microscopes), examination of dentinal map and correct usage of DG16 to explore floor of the pulp chamber, blood spots on pulpal floor that indicate presence of extra canals, use of champagne bubble test using sodium hypochlorite, staining of the pulp chamber using dye, modification of access cavities and use of ultrasonic tips to remove small chunks of tooth material or calcifications [40].

Hence, expecting aberrant anatomy and thoroughly searching for it is an essential requisite that reduces the risk of endodontic failure. The use of DOM, ultrasonics and CBCT proved to be a boon in the endodontic management of the cases discussed.

Conclusion

The literature available indicates towards the presence of aberrant anatomy more than often. Our eyes see what our mind knows. Preoperative examination and careful usage of magnification is beneficial when it comes to locating the hidden extra canals.

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