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Research Article

ENDODONTIC MANAGEMENT OF A MAXILLARY FIRST MOLAR WITH FIVE CANALS WITH THE AID OF CONE BEAM COMPUTED RADIOGRAPHY: A CASE REPORT

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ABSTRACT

This article presents a unique case of maxillary first molar with five canals. Cone beam computed tomography, as a complementary imaging device is used in confirming this unusual canal morphology and completing the endodontic treatment. This case report throws light into the possible variations in root canal anatomy and illustrates the use of imaging modalities like CBCT as a diagnostic adjunct.

Keywords: Cone beam computed tomography, five canals, maxillary first molar.

INTRODUCTION

Successful endodontic treatment often depends on the sound knowledge of the anatomy of root and root canal system. But the root canal morphology of teeth is often extremely complex and highly variable. Maxillary molars are a group of teeth that have a maximum number of variations. Usually the permanent maxillary first molar has three roots and four canals [1]. However, in rare cases, there can be more than four canals. This case presents a maxillary first molar with two distobuccal canals diagnosed with the help of cone beam computed tomography.

Case Report

A 63 year old healthy male patient reported to the Dept. Of Conservative Dentistry and Endodontics with the chief complaint of pain in the upper right back tooth. He also had increased sensitivity to heat and cold in relation to that tooth. Electric pulp testing (Vitality Scanner, Analytic Technology, Glendora, CA, USA) showed a premature response. The periodontal condition of the tooth was normal and no pockets were observed. The intraoral radiograph revealed the presence of a deep carious lesion approximating the pulp (Figure 1). After extensive clinical and radiographic examination, the diagnosis of symptomatic irreversible pulpitis was made and the tooth was prepared for non surgical root canal treatment.

Local anaesthesia was induced with 2% lidocaine containing 1:80,000 epinephrine (Lignox 2% A, Indoco Remedies, Goa, India). A rubber dam was applied and coronal access cavity was established with Endo Access bur and Endo-Z bur (Dentsply Tulsa Dental, Tulsa, OK, USA). All the four canals MB1, MB2, DB and palatal canals were located. In addition an extra orifice was noted between distobuccal and palatal canals (Figure 2). The size 10 ISO K-file (Dentsply Maillefer) was going in almost the same length as in the other canals.

Multiple radiographs were taken at different angulations but were not conclusive. So a multislice CBCT scan (Planmeca ProMax 3D, Finland) was performed of the involved tooth along with the adjacent teeth. All required measures were taken to protect the patient from radiation. The images were obtained in transverse, axial and sagittal sections of 0.5-mm thickness. The scanning was done at a tube voltage of 96 kV, current of 12 mA and exposure time of 12 s.

CBCT scan slices revealed five canals (two mesiobuccal, one palatal, and two distobuccal) in the axial images at coronal and middle thirds (Figures 3, 4). The distobuccal root had only one canal at the apical third indicating that the two canals fused between the middle third and apical thirds (Figure 5).

Later, the working length was determined with the help of an apex locator (Root ZX; Morita, Japan) and confirmed using a radiograph (Figure 6). All canals were instrumented using crown-down pressure less technique using ProTaper nickel-titanium rotary instruments (Dentsply Maillefer) under copious irrigation with 2.5% sodium hypochlorite solution (Prime dental products, India), normal saline and Ethylene Diamine Tetra Acetic acid (Glyde, Dentsply Maillefer). The canals were dried with absorbent points (Dentsply Maillefer). Master cone radiograph was taken (Figure 7). Obturation was done with corresponding protaper gutta-percha points (Dentsply Maillefer) and AH Plus resin sealer (Figure 8). The tooth was restored using posterior composite resin (Filtek Z 250, 3M Dental Products, St Paul, MN)

DISCUSSION

Anatomic deviations in number of root canals and tooth morphology are rare. They can occur as a result of changes either in genetic alterations in tooth development or in the development of Hertwigs epithelial root sheath [2].

The root canal morphology of maxillary first molar show maximum number of deviations. Predominantly, it has three roots with one canal in each root except mesiobuccal root which has a second canal in the range of 57.1 %-61.1%[3].

Five canals have been found in 2.25 % and 2.4% of maxillary first molars as in studies conducted by Acosta Vigorans and Gray respectively. The majority of the fifth canal was found in palatal root followed by mesiobuccal root as found in the the table given below [**Table 1**]. Few cases are reported on the extra canal in the distobuccal root making this case report a rare occurrence. The incidence of two or more canals in the distobuccal root has been found to be in the range of 1.7% of which 97.1% fused at the apex[3].

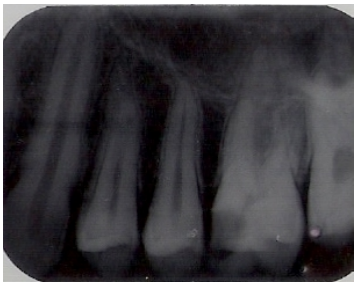

Figure 1: Pre-Operatory Radiograph

Figure 2: Access opening showing five canals: Mesio Buccal Canal 1(MB1), Mesio Buccal Canal 2(MB2), Disto Buccal Canal 1 (DB1), Disto Buccal Canal 2 (DB2) and palatal canal (P).

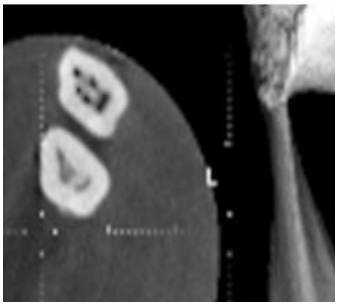

Figure 3: Axial image at coronal third showing five canals

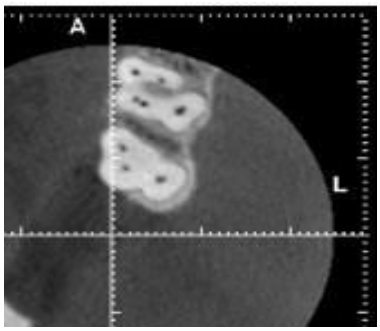

Figure 4: Axial image at middle third showing five canals

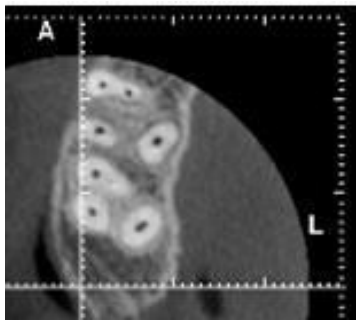

Figure 5: Axial image at apical third showing four canals

Figure 6: Working length radiograph

Figure 7: Master Cone radiograph

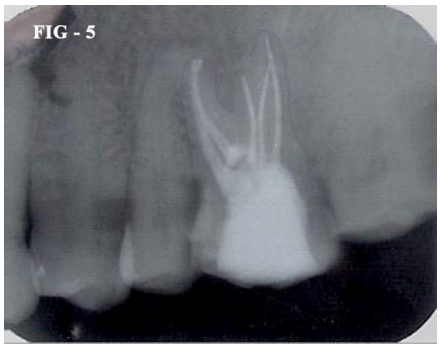

Figure 8: Obturation radiograph

Table 1: Maxillary First Molar Reported With Five Canals (MB - Mesio Buccal, DB - Disto Buccal, P- Palatal).

Root configuration	No. of canals			References
	MB	DB	P	
3 roots	2	1	2	Cecic et al (1982) (5)
3 roots	2	1	2	Holtzman (1997) (6)
3 roots	2	1	2	Johal (2001) (7)
3 roots	2	1	2	Holderriethet al (2009) (8)
3 roots	3	1	2	Favieri et al (2006) (9)
3 roots	3	1	1	Ferguson et al. (2005) (10)
3 roots	3	1	1	Beatty (1984) (11)
3 roots	1	1	3	Wong (1991) (12)
3 roots	1	2	1	Hulsmann (1997) (13)
3 roots	1	2	1	Chen and Karabucak(2006) (14)

Finding these extra canals can be a challenge to the treating clinician. CBCT is a diagnostic imaging modality which can be of great help in identifying additional canals. Missed and extra canals can easily be identified in CBCT axial slices which may not be readily noticed with periapical radiographs even if taken at different angles. It also helps in identifying the root canal configuration whether they join together or run individually. CBCT evaluations identified more number of root canals in contrast to conventional radiographs where chance of missing a canal is more [15].

Other applications of CBCT in endodontics include detecting dental and periapical pathosis, evaluating root fracture and identifying internal and external root resorption. However CBCT has not gained much popularity when compared to conventional radiographs, due to inherent limitations like high cost and radiation. The patient was given a metal ceramic crown later.

CONCLUSION

Clinicians should always be aware of the possible anatomic deviations in root canal morphology that can occur with each

tooth when doing root canal treatment. The investigational use of CBCT as a complementary imaging device helps in identifying these variations and is highly recommended in endodontics.

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