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Morphologic Aberrations of Mandibular Premolar with two and Three Canals: Case Report

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Abstract

The mandibular premolars are more prone to aberrations of canals. They include bifurcation and trifurcation of canals which makes it difficult to diagnose and manage. The failure to treat them leads to re-infection and persistence of infection in the tooth. Hence, it is of utmost importance for the clinician to know the morphologic variations. The present case report is aimed to give a clinical insight of such aberrations. The first case presents with mandibular first premolar with 2 roots and 2 root canals and second case is a mandibular second premolar with 1 root and 3 canals which was diagnosed with CBCT. Both the cases were treated endodontically and successfully managed.

Keywords: *mandibular premolar, three root canals, two root canals.*

Introduction

Variation in the morphology of root canal system occurs commonly and can be considered as normal. The knowledge of the canal anatomy is essential for successful endodontic management. The clinician should be aware of the complexity of the root canal system and also be capable of identification of the variation [(1)]. Amongst the human permanent dentition, it was reported that the mandibular premolar teeth had the most variable canal pattern [(2)]. The mandibular premolar had the highest failure rate – 11.45% [(3)].This may be attributed to the frequent variations in the root canal morphology and the inability to access extra canals.

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Zillich and Dowson have observed that the incidence of three canals in mandibular second premolar is 0.4% [(4)]. Pucci and Reig, observed that the mandibular second premolar had two canals and two foramina in 11.5% teeth and the mandibular first premolar had branching canals, apical bifurcations, and trifurcations 26.5% of the teeth [(5)]. Cleghorn et al, reviewed the mandibular first and second premolars, reported that approximately 98% of mandibular first premolars were single-rooted with a single canal in 75.8% of the teeth. In cases of second premolars, almost all of the teeth in the anatomic studies were single-rooted (99.6%) with a single canal (91.0%) [(6)]. As the occurrence of extra canal is relatively rare and the purpose of this report is to provide an insight on clinical management of such cases.

Case Report 1

A 38-year-old male patient reported with a chief complaint of pain in the lower right back tooth since 3 months. History revealed that patient had experienced pain. Pain was spontaneous in nature and aggravated on chewing and lying down. On intraoral examination, there was a carious exposure of the pulp and the tooth was tender to percussion. A provisional diagnosis of acute irreversible pulpitis with apical periodontitis was made. Radiographic evaluation of the involved tooth (# 44)

revealed outlines of two canals. An angulated radiograph showed 2 roots (figure 1a, 1b). Access preparation was made in the right mandibular first premolar and two orifices were located (buccal and lingual) with the help of operating microscope and careful manual exploration (figure 1c). With 10 K file negotiation was done and working length was measured with electronic apex locator and confirmed with radiograph (figure 1d). Both the canals were prepared using hand K file till no 20 followed by Neo Endo file (Orikam, India) till 25, 0.06 (figure 1e). During preparation, the canals were lubricated and irrigated with EDTA and 2.5% NaOCl. Calcium hydroxide dressing was placed in the canals and temporary restoration was done. After two weeks, the canals were coated with AH plus sealer and obturated in the lateral Compaction technique and the tooth was restored with composite resin (figure 1f).

Case Report 2

A 49 year old female patient came with the chief complaint of intermittent pain over two months in lower right back teeth region. Patient also complained of episodes of sensitivity to cold drinks in the involved tooth. Medical and dental history was non-contributory. Deep disto-occlusal carious lesion was observed in tooth #45 and was tender on percussion. Based on clinical and radiographic evidences a diagnosis of irreversible pulpitis was made (figure 3a) and an angulated radiograph shows a complex pulp anatomy (figure 3b). Root canal treatment was planned. Cone beam computerized tomography was performed to understand the root morphology which shows trifurcation namely buccal, mesio lingual and distolingual canals (figure 2). Access preparation was made in the right mandibular second premolar. With the help of operating microscope and careful manual exploration was done to locate 3 orifices (figure 3c). With 10 K file negotiation was done and working length was measured with electronic apex locator and confirmed with radiograph (figure 3d). The three canals were prepared using hand K file till no 20 in step back method and Neo Endo file (Orikam, India) 20, 0.04% (figure 3e). During preparation, the canals were lubricated with Endoprep- RC and irrigated with 2.5% NaOCl. The calcium hydroxide dressing was placed in the canals and temporary restoration was done. After two weeks, the canals were coated with AH plus sealer and obturated in the lateral Compaction technique and the tooth was restored with composite resin (figure 3f).

Table 1: Incidence of 2 canals in premolars of various racial groups

Investigator	year	Ethnicity	incidence
PINEDA(8)	1972	Hispanic	1.2%
VERTUCCI(9)	1978	Caucasians	2.5 to 34.4%
SERT(10)	2004	Turkish	6.4 to 29%
RAHIMI(11)	2007	Iranian	5.8–17.5%
AWAWDEH(12)	2008	Jordanian	22.8%
PAREKH(13)	2011	Indian	13.5–20%
ZHANG(14)	2012	Mongoloid	2%

Name of author	year	No. of roots	No. of root canals
Rodig(16)	2003	1	3
Sachdeva(17)	2008	4	4
Aguiar(18)	2010	2	3
Poorni(19)	2010	2	3
Borna(20)	2011	1	3
Bhavana(21)	2013	3	3

Table 2: Case reports with three or more canals in mandibular premolar

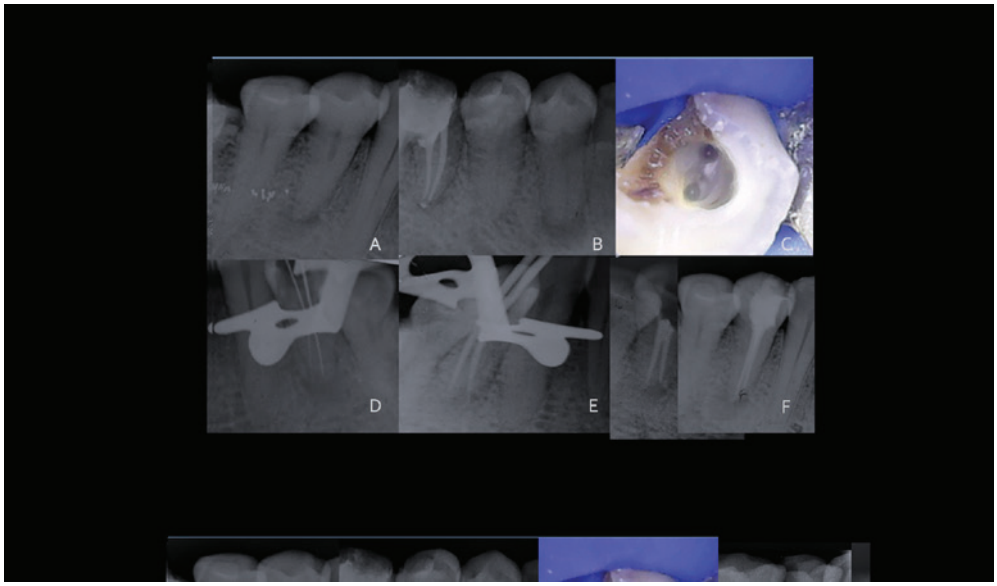

Figure 1: CASE 1: (A): pre-operative radiograph, (B): pre-operative mesial angulated radiograph, (C): orifice location (buccal and lingual), (D) working length determination, (E) master cone, (F) obturation and post endo restoration

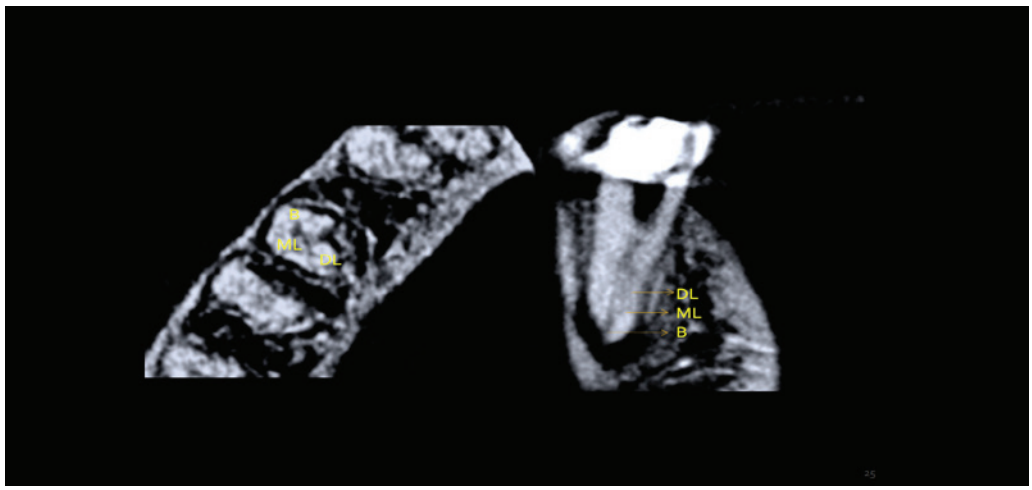

Figure 2: CASE 2: CBCT showing 3 canals on the middle third (buccal, mesio-lingual and disto-lingual) joining short of apex.

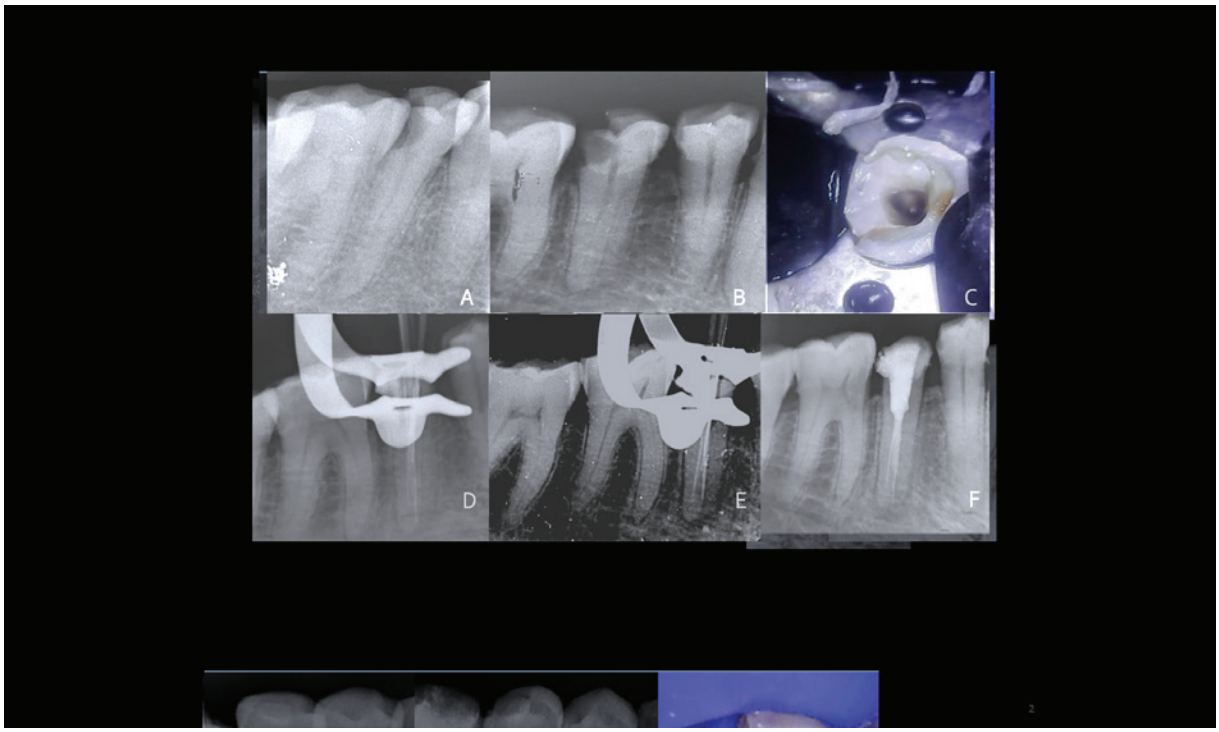

Figure 3: CASE 2: (A): pre-operative radiograph, (B): pre-operative mesial angulated radiograph, (C): orifice location (buccal, mesio-lingual and disto-lingual), (D): working length determination, (E): master cone, (F): obturation and post-endo restoration

Discussion

The presence of two roots in mandibular first premolar was 2.63% [7]. The mandibular first premolar is more prone to bifurcation of canals (23–30%) terminating in multiple apical foramina (15–20%), as compared to second premolars (Table 1 shows incidences of a second canal in various populations) [8-13]. In the present case 1, the mandibular first premolar had 2 root canals of vertucci type IV configuration which had an incidence of 0.27% and in case 2 the mandibular second premolar with 1 root and 3 root canals with vetucci type VIII configuration and incidence of 0.1% [15] (Table 2 shows case reports with 3 or more canals) [16-21] . In the present case the root canals in mandibular second premolar trifurcated at the middle third and later joined short of the apex, exiting at one foramen. Anatomic studies of mandibular second premolar canal morphology found that a one canal was seen in 91.0% of the teeth. A single apical foramen was found in 91.8% of the teeth [7]. The varied canal morphology can be understood through the development of root formation. Where, during root formation the aberrations occur and they have genetic and racial predilection. Higher incidences of two roots was seen in the African-American population (16.2%) and three or more rooted formation was reported in only 3% in French and 0.2% in Indian populations [7]. This shows the complexity of the premolar canal morphology which needs careful evaluation. A CBCT was use to evaluate canal morphology as it helps in better visualization of canal anatomy and helps in treatment planning [22].

Conclusion

The basics of endodontic therapy begin with appropriate diagnosis and treatment plan. Proper knowledge of root canal system is of great importance in treatment planning. With the advent of advanced microscope, CBCT and NiTi file system, detection of aberrant anatomical variation is rather a norm than an exception, which if misdiagnosed and left untreated or incompletely treated leads to failure.

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Ethical Clearance : Not required for a case report.

Conflict of Interest : Nil

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