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CASE STUDY

ENDODONTIC MANAGEMENT OF ABERRANT ANATOMY IN MANDIBULAR FIRST AND SECOND PREMOLARS - TWO CASE REPORTS

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ABSTRACT

Abnormalities in the root canal anatomy are commonly occurring phenomenon. A thorough knowledge of the root canal anatomy and its variations is necessary for successful completion of the endodontic treatment. Mandibular Premolars are known for having an aberrant anatomy. Mandibular first Premolars have high flare-up and highest failure rates because of extreme variations in root canal morphology. The incidence of two roots in mandibular first premolar is quite rare (1.8%).This case report presents a relatively uncommon clinical case of mandibular first and second premolar with bifurcated roots. Careful interpretation of the preoperative radiograph, close clinical inspection of the floor of the chamber and proper modification of access opening are essential for a successful treatment outcome.

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INTRODUCTION

Successful endodontic therapy requires a thorough understanding of root canal anatomy and morphology. The root canal anatomy of teeth is variable (Brown and Herbranson, 2005). A number of factors contribute to the variations found in the root canal of permanent teeth like ethnic background, age, and gender of the population.Mandibular premolars shows a high occurence of c variable root canal anatomy and hence, they are considered as most difficult teeth for endodontic therapy (Slowey, 1979). In 1969, Weine *et al*. (Weine *et al*., 1969) gave the first classification clinically of more than one canal system in a single root using the mesiobuccal root of maxillary first molar as the specimen. Pineda and Kuttler (Kuttler and Pineda, 1972) and Vertucci (Vertucci, 1984) further developed a system for classification of anatomy of canal of the teeth and classified them as Type I through Type VIII.

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Gulabivala *et al*. studied the root canal anatomy of mandibular molars and identified seven additional canal types according to the number of orifices, canals, and apical foraminas (Nallapati, 2005). Slowey *et al* (1979) shown that because of variations in canal pattern, the mandibular premolars are the most challenging teeth to treat endodontically.Mandibular premolars was shown the most common reason for the increased frequency of endodontic flare-ups and failures (Slowey, 1979).

Many studies (Poorni *et al*., 2010; Gulabivala *et al*., 2001) have shown, mandibular premolars had a single root (99.6%). Two roots were found in only 0.3% of the teeth studied. One canal was present in 91.0% teeth studied. Two or more canal systems were present in 9.0% of the teeth studied. Many case reports shows anatomic variations of the root canal system of a mandibular first and second premolar with bifurcation or trifurcation at mid root and apical third levels. This case report demonstrates clinical case of mandibular first premolar and second premolar with bifurcated roots with proper consents of patients.

CASE REPORTS

Case No.1: A 55 year old male with non contributing medical history was referred to the Department of Conservative Dentistry and Endodontics with chief complaint of pain in lower left back region since 2months. A deep proximal caries in distal aspect of tooth #35 was seen clinically, the tooth was tender on percussion. An angled radiograph revealed a second premolar with bifurcated roots and a large distal carious lesion involving the pulp chamber. Periodontal ligament space widening was noted (Fig. 1.). After conducting all relevant clinical, radiographic and vitality tests, diagnosis of symptomatic apical periodontitis of the left mandibular second premolar (#35) with type IV canal configuration was made. Treatment plan consisted of endodontic therapy followed by suitable extracoronal restoration.

Case No. 1 Figure 1.

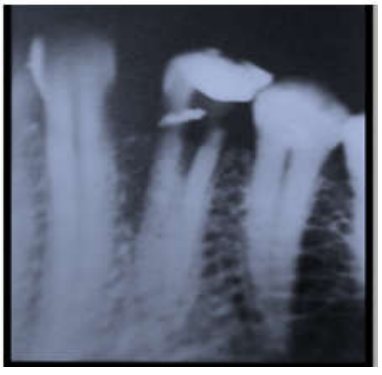
Case No. 1 Figure 2.

Case No.1 Figure 3.

Case No. 1 Figure 4.

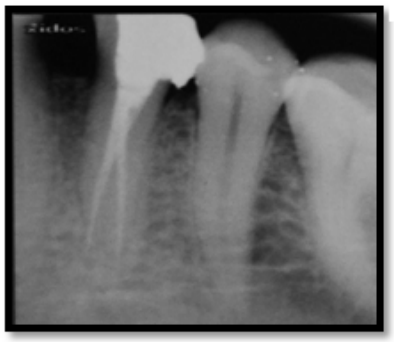
Upon securing anaesthesia and adequate endodontic access with high-speed airotor handpiece,a sharp endodontic explorer was used to locate the canal orifices. The level of the bifurcation of the canal was physically noted with the help of endodontic probe. Gates-Glidden drills (Maillefer, Switzerland) no# 3,2,1 mounted on a slow speed handpiece under copious irrigation with 2. 5% sodium hypochlorite (NaOCl) (vishal Dentocare, India) were used to enlarge the main orifice short of the level of the bifurcation. Canal patency and initial glide path was established with 2% precurved #6,#8, #10 K-file (Mani Inc.,Tochigi, Japan). The files were precurved at about 5mm distance from the tip and inserted in such a way that one was directed buccally and one lingually. "Initial working length was determined using apex locator (Propex II apex locator, DentsplyMallefier Ballaigues, Switzerland) and confirmed with radiographs.

The buccal and lingual dentinal overhangs at the level of the bifurcation were removed with the help of no # 25 K3 rotary files (Sybron Endo) 12% and 10%, used in a brush stroke manner. The files for each of the canals were inserted from the opposite cusp area and then straightened towards side of the canal which was being instrumented, thus obtaining a straight line access. The "Final working length" was measured with the help of apex locator and confirmed by radiograph (Fig.2) Cleaning and shaping was done using crown down technique with K3 rotary files (sybron endo) to master apical file size ISO size 25 (4%taper) the canal was irrigated with 2.5% (NaOCl) and 0.9% saline (Claris life sciences Ltd, India) alternatively at each increment of files and recapitulation was done to maintain patency of the canal. Master cone radiograph was taken to ascertain proper fit of the gutta percha (Fig.3). The canal was then obturated with conventional cold lateral compaction gutta-percha technique and AH Plus sealer (Dentsply, Germany) and confirmed radiographically. Core buildup was done with silver amalgam (Fig.4).



Case No. 2 Figure 1.

Case No. 2 Figure 2.



Case No. 2 Figure 3.

Case No. 2 A 29-year-old male patient presented to the Department of Endodontics, with the chief complaint of pain in his lower right back tooth for a week. History revealed patient had spontaneous and lingering pain on taking cold and hot foods. On performing cold test, patient had lingering pain after removal of stimulus and delayed response to hot stimulus. Clinical examination revealed deep caries in lower right madibular first premolar (#44). Tooth was tender on percussion. Radiographic examination of tooth #44 indicated caries extending to the pulp chamber. The root canal anatomy indicated presence of two roots (Fig.1). A second radiograph was taken with more mesial angulation for clearity (tube shift technique). Two roots were found and were distinguished as buccal and lingual on the basis of clark's SLOB rule. The two roots divided at mid root level, also there was widening of apical periodontium. The diagnosis of symptomatic irreversible pulpitis was made necessitating root canal therapy for #44.

A standard endodontic treatment was performed and after deroofing the pulp chamber, two orifices were seen under the buccal and lingual cusps respectively. The orifices were enlarged with GG drills #2&3. After obtaining the canal patency, (ISO) size #8 K files were inserted and working length was determined radiograph taken with mesial angulation (Fig.2) and confirmed with Root ZX (J. Morita Corp. Tokyo, Japan) apex locator. After establishing a glide path with size #10 and # 15K (malleifer) files, both the canals were shaped with a crown down technique till protaper F3 files (Dentsply Mallefier Ballaigues, Switzerland). In between instrumentation, copious irrigation was done with 2.5% NaOCl and saline and recapitulated with smaller files. Master cone was selected. Both the canals were obturated with protaper guttapercha points and AH Plus sealer (Dentsply, Germany) sealer (Fig.3). After one week tooth was asymptomatic and restored with permanent restoration.

DISCUSSION

Hess showed variation and complexity of root canal systems establishing that a root with a tapered canal and a single foramen was the exception rather than the rule (Burns and Herbranson, 2002). Examination of the pulp chamber floor may offer clues to the location of orifices and type of canals present. The internal dentinal map of the pulp chamber floor help to identify presence of other root canals aberrations. The root shape, root position and relative root outline should be carefully examined on the preoperative radiograph. A cone shift radiograph of 15 or 20 ^{o} angle is necessary to accurately diagnose the number of roots and canals in premolar teeth (Zillich, 1973).

Bifurcations of root canal in mesiodistal direction is easily visible on the radiograph, however bifurcation in the buccolingual direction demands careful observation and evaluation of the preoperative radiograph. "Sudden narrowing of the main canal" or "fast break rule"of the canal shows the presence of bifurcation in the main canal in the buccolingual direction (Baisden, 1992). Zillich and Dowson reported that second root canal existed in 23% of first mandibular premolars and in 11.7% of second mandibular premolars (Sikri and Sikri, 1994). Green found that 14% of first mandibular premolars and *8%* of second mandibular premolars had two root canals. According to Vertucci 25.5% of 400 first mandibular premolars studied, there were "two canals at the apex" while in 400 second mandibular premolars there were only 2.5% (Nallapati, 2005). Kerekes and Tronstad (Cleghorn, 2007) reported that in 20% of first mandibular premolars and in 10% of second mandibular premolars there were two root canals. The clinician should carefully trace the exterior and interior outlines of the tooth in radiograph with adequate magnification. The interpretation of the periodontal ligament space may suggest the presence of an extra root or canal. Martinez-lozano *et al*. recommend upto 40˚ mesial angulation from horizontal is more reliable in showing the extra canals. Deviation of the xray angle from the vertical axis of 15˚-30˚ was effective only in the mandibular first premolar to visualize canal anatomy of premolar teeth.An endodontic explorer helps in locating the canal orifices and any overhanging dentinal shelves and a graduated periodontal probe can be used successfully in gauging the point of bifurcation and locating the individual canal orifices (Tzanetakis, 2007).

Conclusion

The clinician should have accurate knowledge of the anatomy of each tooth as well as the canal variations,to identify the unusual numbers of roots and their morphology. Careful interpretation of the radiograph with good clinical examination of the chamber floor and proper modification of access opening, the position, angulation of the file in the canal also shows the presence of extra canal and are essential for a successful treatment outcome. In the present cases, although the root canal morphology were complex, it was clearly determined on the preoperative radiograph. After identification, proper cleaning and shaping of the root canals were carried out followed by complete obturation of all the canals to achieve a predictable long-term endodontic prognosis.

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