



Mandibular Premolars, an Enigma to Endodontists : A Case Series

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ABSTRACT :

Successful endodontic therapy depends on understanding, knowledge and possible anatomical variations of the root canal system to locate, prepare and obturate the canals. There is a considerable variation and aberrant root canal anatomy in mandibular premolars that can be difficult to diagnose. Mandibular premolars usually have a single root and single canal, presence of 2 or 3 canals in separate roots is rare. Diagnosis and endodontic treatment of such teeth is challenging. This case report describes three cases of endodontic management of mandibular premolars with 2 and 3 root canals in separate roots. The possibility that there is more than 1 root canal in mandibular premolar teeth must be considered in the radiographic and clinical examination during root canal treatment.

KEYWORDS: Abnormal morphology, mandibular second premolar, number of canals, root canal morphology, root canal configuration.

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INTRODUCTION:

Endodontic treatment necessitates complete debridement and obturation of the root canals giving a three dimensional seal. This is not possible without adequate knowledge of root and root canal anatomy, from correct diagnosis to negotiating all the canals especially of the diverse root canal anatomy present in human teeth. Ingle states that mandibular premolars are the most complex and it is a challenge to endodontically treat them. [1]

Significant cause for endodontic failures is incomplete canal instrumentation and incorrect canal obturation. Most likely reason for endodontic failures and flare-ups is variation in root canal morphology. Slowey^[2] has indicated that probably because of the variations in canal anatomy, the mandibular premolars are the most difficult teeth to treat endodontically.^[3]

Typically described in textbooks, the mandibular premolar is a 'single-rooted' tooth depicting a 'single' root canal. The root canal system is wider bucco-lingually than mesio-distally. Two pulp horns are present, a large pointed horn and a small, rounded lingual horn. At the cervical line the root and canal are oval, this shape tends to become round as the canal approaches the middle of the root. If two canals are present, they tend to be round from the pulp chamber to their foramen. In another anatomic variation, a single broad root canal may bifurcate into two separate root canals.^[9] The ovoid-shaped root in cross section normally has developmental grooves or depressions on the mesial and distal surfaces.^[4] Vertucci have classified canal morphology into various types. Vertucci has reported that 97.5% mandibular second premolars and 74% mandibular first premolars have one canal at the apex.^[16]

CASE REPORT 1 :

A 40 year male reported to the Department of Conservative Dentistry and Endodontics with chief complaint of pain in mandibular lower

right back tooth region. There was non contributory medical history. Clinical examination revealed deep distal and occlusal caries with respect to mandibular right first premolar. The tooth was tender on percussion. Radiographic examination revealed caries involving the pulp and widening of the periodontal

ligament. The preoperative radiograph showed two separate roots and root canals. A diagnosis of symptomatic irreversible pulpitis with symptomatic apical periodontitis was made with mandibular right first premolar. Written informed consent was obtained from the patient for nonsurgical endodontic treatment.

Local anesthesia was administered with 2% lidocaine by way of inferior alveolar nerve block. Tooth was isolated with application of a rubber dam and access cavity was prepared. Pulp extirpation was done and a working length radiograph was obtained with k files placed in the buccal and lingual canal (Figure 1-a). Root canal orifices were enlarged and straight-line access was improved using Gates-Glidden drills. The root canals were prepared with crown down technique. Irrigation was performed with 5.25% sodium hypochlorite solution and 17% ethylenediaminetetraacetic acid with saline as a final rinse. The canals were dried with absorbent points, and obturation was completed with cold lateral compaction of gutta-percha with AH Plus resin sealer (Dentsply Maillefer, Germany) (Figure 1-b,c). A post-obturation radiograph was obtained and the coronal access cavity was restored.

CASE REPORT 2 :

A 27 year male reported to the Department of Conservative Dentistry and Endodontics with chief complaint of pain in mandibular lower left back tooth region. Medical history was non contributory. Clinical examination revealed deep distal caries with respect to mandibular left second premolar. Radiographic examination revealed caries involving the pulp and widening of the periodontal ligament.(Figure 2-a) The preoperative radiograph showed two separate roots and three root canals. A diagnosis of

asymptomatic apical periodontitis was made with mandibular left second premolar based on clinical and radiographic examination. Written informed consent was obtained from the patient.

Local anesthesia was administered and after the application of a rubber dam access cavity was prepared. The root divided into two roots and three canals at the middle third. So the canal was coronally flared till the midroot level for achieving ease of instrumentation. The root canals were prepared with crown down technique along with copious irrigation.(Figure 2-b)After the canals were dried with paper points, obturation was done with lateral condensation technique.(Figure 2-c) A post-obturation radiograph was obtained and the coronal access cavity was restored.(Figure 2-d)

CASE REPORT 3 :

A 33 year male reported with chief complaint of pain in mandibular lower right back tooth region. There was non contributory medical history. Diagnosis of asymptomatic irreversible pulpitis was made with mandibular right first premolar (Figure 1-d). Written informed consent was obtained from the patient for nonsurgical endodontic treatment and documentation. After access opening, canals were located. Biomechanical preparation was done and the tooth was obturated with cold lateral compaction of guttapercha cones using AH Plus sealer(Figure 1-e).

In all the three cases, due to the typical lingual inclination of the mandibular premolars, the lingual wall of the access cavity was extended farther lingually, to make the lingual canal easier to locate and to get a straight line access to all the canals. After adequate coronal flaring and precurving of the hand files, the bifurcations in the root and root canals were able to locate. Copious Irrigation was done using 3% sodium hypochlorite, 17% ethylenediaminetetraacetic acid and saline in all the cases. Application of sealer with

lentulospiral following which obturation was done using lateral condensation in all the cases. Post obturation restoration was done

with composite resin.

DISCUSSION:

A complex anatomy of root canal system always poses a challenge at every operatory step. Just like any other teeth, a tenet that applies to the premolar is the success rate of endodontic treatment is likely to be reduced if a root canal system is not adequately cleaned and obturated. Studies have shown that the most endodontically difficult teeth to treat are mandibular premolars due to wide variation and aberrant root morphology.[5] Therefore, it is essential to assess the canal morphology, assessing the number of canals present and the course of the canals before commencing the root canal treatment. An additional canal should be suspected, if a radiolucent line is suspected mesial or distal to the main canal.[15]

Identification of the internal canal morphology and assessing the pulp chamber should be the preliminary and most precise step of the treatment. Anatomical landmarks, colour changes of the pulpal floor during inspection may help to identify the orifices.[6] Use of handfiles for tactile exploration of root canals and its aberrations is imperative. Vertucci had stated that if there is sudden narrowing or disappearing of pulp space, the canal is diverged into two parts.[16]

Pre operative radiographs should be obtained and studied at different angulations. More precise interpretations using cone-beam computed tomography reveal external and internal anatomic details and/or variations that suggest the presence of extra roots and root canal. The use of 3-dimensional imaging methods in future large anatomic studies would be of value in assessing the occurrence and the frequency of anomalous canal morphology. To identify additional canals Martinez-Lozano et al^[12] suggested a 40-degree mesial angulation of the x- ray beam. The use of magnification has been demonstrated to improve the clinician's ability to visualize and access canals^[13,14]. In a previous study it was summarized that approximately 98% were single rooted, 1.8%

had 2 roots, 0.2% had 3 roots, and less than 0.1% had 4 roots among the 6700 mandibular premolars studied.^[21] The role of genetics is just being appreciated in identifying anomalies caused by syndromes and even ethnicity or gender variation in morphology^[7,8].

In this case series, a key factor to be cautious of during biomechanical preparation of root canals was instrument selection, especially with the presence of radicular grooves. Instruments with bigger tapers could lead to strip perforations of the roots and straightening of canal, causing loss of original canal anatomy^[10]. Therefore, the preparation in all the above cases was done upto 20 with a taper of 4%.

In 1969, Weine et al, provided the first clinical classification of more than one canal system.^[17] Pineda, Kuttler and Vertucci further developed a system for canal anatomy classification for any tooth having a broad buccolingual diameter.^[18,19] Additional canal types were reported by Sert and Bayirli.^[20] The first case report presented a mandibular first premolar with Vertucci Type 5 (1-2) configuration, while the case report 2 presented Type 16(2-3), Sert and Bayirli's modification and third case report presented Vertucci Type 4(2) configuration.

CONCLUSION:

Although the frequency of more than single canal is low in mandibular premolars, each case should be suspected and inspected clinically and radiographically to detect any aberrant or additional canals. Knowledge of the tooth and root canal morphology is of utmost importance for a successful endodontic treatment.

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FIGURE 1

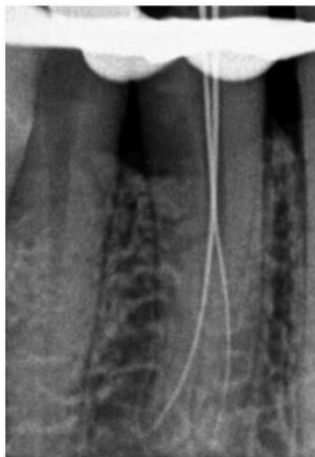


Figure 1 (a)



Figure 1 (b)



Figure 1 (c)

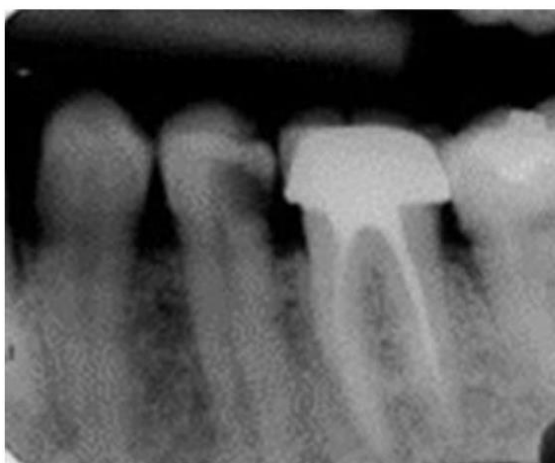


Figure 1 (d)

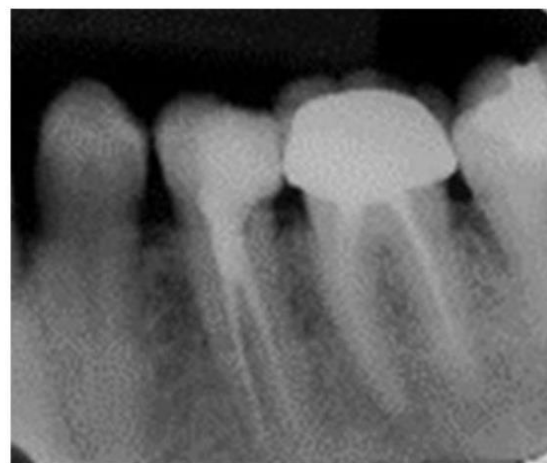


Figure 1 (e)

FIGURE 2



Figure 2 (a)- Pre-operative Radiograph



Figure 2 (b)- Working length determination



Figure 2 (c)- Mastercone Radiograph



Figure 2 (d)-Post obturation Radiograph