Endodontic Management of Three Rooted Maxillary First and Second Premolars: Two Case Reports

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Abstract

Before initiating endodontic treatment external root morphology, root number and canal system and possible variations and anomalies should always be considered. These variations make diagnosis and treatment clinically challenging. Failure to recognize the presence of an additional canal or root may result in unsuccessful treatment and may be the origin of acute flare-ups during and after treatment. Endodontic success in teeth with variations requires a correct radiographic diagnosis and careful clinical intervention. An awareness and understanding of the presence of unusual root canal morphology can thus contribute to the successful outcome of root canal treatment. Relatively few case reports of variations and anomalies in maxillary first and second premolars have been published. We are reporting here endodontic treatment of a maxillary first and second premolar with three distinct roots and three distinct foramens with the aim of highlighting the diagnosis and clinical management of these rare variations.

Key words: Root morphology, Possible variations, Three rooted maxillary premolars, Endodontic management

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1. Introduction

Knowledge of dental anatomy and possible variations is one of the key factors needed for the success of endodontic treatment. Extra roots are an additional challenge, which begins at case assessment and involves all operative stages including cavity design, canal access, localization and cleaning and shaping of root canal system (1). Therefore, the accurate radiographic examination using horizontal angle variation is of great importance for the endodontist to distinguish the roots and root canals and hence assist with a correct diagnosis (2). All categories of teeth may have extra roots and/or canals, but the likelihood of finding aberrant canal configurations is higher in premolars and molars (3). The most common canal configuration for the maxillary first premolar is Vertucci’s type IV (two separate canals in one root) with a frequency of about 60–65%, Vertucci’s type V (one canal divides into two) found in 6–7%. In about 8–9% of cases, the maxillary first premolar can have one canal and in 16–18%, two canals joining

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into one. Furthermore, maxillary first premolars can have three roots with three canals (mesio-buccal [MB], disto-buccal [DB], and palatal) in 2.5–5% of cases with a canal and root disposition so similar to that of adjacent first molars that they are sometimes called small molars or ‘radiculous’ 2 (Maubaum 1989, Goon 1993) (1,3). Maxillary second premolars have one canal in one root in 38–48% of the cases, two canals joining in one root in 20–22% of the cases, one canal separated into two canals that rejoin in the apical third (Vertucci’s type III) in 5–10% of the cases, two canals in two roots in 10–20% of the cases, and one canal that splits and exits as two canals (Vertucci’s type V) in 6–9% of the cases. Three rooted second premolars have been reported by Barkhordar & Sapone, Ferreira et al., and Low while a case of three-rooted maxillary first and second premolars has been reported by Soares & Leonardo. In case of second premolar laboratory studies have demonstrated a lower incidence of three root canals between 0.3 and 2% (1,3,5). Kerekes and Tronstad did not find maxillary second premolars with three canals in their studies. Pecora et al. found the incidence of three canals to be 0.3%. Unlike mandibular premolars anatomic variation and the frequency of teeth with this abnormal root canal anatomy in maxillary premolars is very low. In case of maxillary first premolar three roots are found in only 1.1% of cases and three canals in 1.4% of cases. Similarly, three roots are found in 0.2% and three canals in 1.2% of cases in case of maxillary second premolar (5). Keeping this in view a thorough inspection of periapical radiograph and a minimum of two diagnostic radiographs should be taken with parallel and shift cone angle technique to diagnose such aberrations (6). Clinically, three-rooted, three-canal premolars present crowns with greater dimension and greater mesiodistal width when compared with premolars with single roots. Sieraski et al. found that whenever the mesio-distal width of the midroot image was equal to or greater than the mesio-distal with of the crown, the premolar most likely had three roots (2). Buccal canals in three rooted premolars usually lie close to each other and are usually covered by a cervical projection of dentin. So the access cavities were slightly widened in the mesio-distal direction to uncover the second Buccal canal. Thus, it is necessary for the clinician to have knowledge of not only understand dental anatomy but its variations (7). Based on this information; we diagnosed and proceed with the treatment of two patients with three rooted maxillary first and second premolars.

2. Case report 1

A 48-year-old patient reported with chief complaint of lingering pain in maxillary second quadrant. Clinical and radiographic examination reveals cariously exposed maxillary first premolar with three roots diagnosed from radiograph and confirmed by another angled radiograph. There was positive and lingering response when the tooth was exposed to cold stimulus (Endo-Frost, Roeko, Germany). No swelling or fistula was present. A diagnosis of irreversible pulpitis was made. The tooth was anaesthetized, isolated with rubber dam and the coronal access was prepared. The pulp was accessed and three root canals were found, two buccal and one palatal. The root canal length was established with a radiograph and was confirmed using an electronic apex locator Root ZX (J. Morita, Japan). Sodium hypochlorite (5%) and ethylene diamine tetra acetic acid (17%) solutions were used as irrigants using EndoVac (Sybron Endo) throughout the procedure. Instrumentation of root canals was done with rotary protaper files with master apical file F2 in buccal canals and F3 in palatal. After this obturation with gutta-percha cone and a resin based sealer (AH plus; Denstply) was done using lateral compaction technique. Obturation was confirmed on a radiograph. Later composite build-up of crown was done.

Figure 1. Delivery of irrigant via EndoVac
3. Case report 2

A 22-year-old female patient sought treatment with localised, intense, spontaneous and continuous pain associated with the left maxillary second premolar. There was positive and lingering response to cold stimulus. A preoperative periapical radiograph revealed the presence of carious lesion on distal surface and presence of three independent roots with three root canals and a periodontal ligament with normal thickness indicating irreversible pulp damage. Local anaesthesia was performed with 2% lidocaine with epinephrine 1:100 000. After rubber dam isolation, pulp was accessed and the root canal length was established. Instrumentation of root canals was done with rotary protaper files with master apical file F2 in Buccal and F3 in palatal. Irrigation was done as in previous case. They were then obturated with laterally condensation with gutta-percha and AH Plus sealer (Dentsply).

4. Discussion

A thorough knowledge of root canal anatomy and its possible variations is paramount for successful endodontic treatment. In suspected cases of varied anatomy periapical radiographs with angle variation facilitate root canal detection. Variations reported in literature and case reports with respect to frequency of number and shape of canals and number of roots should be taken into account. Our case study presented the treatment of these variations to
highlight the importance of background knowledge of anatomy and accurate investigations, which may include multiple angled radiographs or CBCT in specific cases. Access cavity should be modified to locate additional roots and canals. The possibility of an inheritance pattern in the determination of this type of endodontic anatomic variation may be considered.

Conclusion

Morphological variations in pulpal anatomy should be considered before beginning treatment. These cases of rare variation in maxillary premolar anatomy are presented here to help diagnoses and clinical management of these variations.

References