

Endodontic Treatment of 3-Rooted Maxillary First Premolar (Radiculous 3): A Case Report

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Abstract- 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%. Another canal morphology, Vertucci's type V, with one canal that extends from the pulp chamber to mid-root, where it divides into two canals, can be found in 6–7% of cases. In about 8–9% of cases, the maxillary first premolar can have one canal and in 16–18%, two canals joining into one. Furthermore, maxillary first premolars can have 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 3”. In case of three root canals this third canal can be missed easily. To avoid errors, a careful examination of the radiograph and pulp chamber floor should be performed, looking for the position and symmetry of canal orifices.

This case series describes the endodontic treatment of maxillary first premolars with three root canals. In these cases true knowledge of tooth morphology, properly evaluate diagnostic x-rays and access cavity preparation could help successful root canal treatment.

Keywords: Maxillary first premolar, Root canal morphology, Radiculous 3, Anatomical variations, Small molars, Endodontic treatment.

Introduction

The dentist must have a thorough knowledge of root canal morphology before he/she can successfully treat a tooth endodontically. According to Seltzer and Bender, failures in treatment occur despite rigid adherence to the basic principle. Ingle lists the most frequent cause of endodontic failure as apical percolation and subsequent diffusion stasis into the canal. The main reasons for this failure are incomplete canal obturation, an untreated canal and inadvertent removal of a silver cone. A canal is often left untreated because the dentist fails to recognize its presence. Extra roots are an additional challenge, which begins at case assessment and involves all operative stages, including cavity design, canal access and localization, cleaning and shaping of the root canal system [1].

Maxillary first premolar exhibits the greatest variation in root anatomy and root canal morphology. Hence, adequate familiarization of tooth morphology is mandatory for such cases. 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%. Another canal morphology, Vertucci's type V, with one canal that extends from the pulp chamber to mid-root, where it divides into two canals, can be found in 6–7% of cases. In about 8–9% of cases, the maxillary first premolar can have one canal and in 16–18%, two canals joining into one. Furthermore, maxillary first premolars can have 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 3” [2,3]. Neelakantan et al. found that ratio as 2.2% among Indian population [4]. Careful interpretation of preoperative radiographs taken at different angles may eliminate this confusion [7,8]. The aim of this article is to present case reports discusses the diagnosis and successful treatment of a three-rooted maxillary first premolar.

Case Report

Case 1

A 27-year-old male patient reported with the complaint of pain in his upper left posterior region since 1-week. On clinical examination, a distoproximal caries lesion was detected on maxillary left first premolar (24), the premolar was tender on percussion. An intraoral periapical radiograph revealed distoproximal radiolucency of the crown extending close to the pulp chamber of 24 [Figure 1]. Intraoral periapical (IOPA) X-ray also revealed a complex radicular anatomy with two buccal roots and a separate palatal root for 24. Electric pulp testing also was done, and 24 exhibited a delayed response. Maxillary left first premolar (24) was diagnosed with irreversible pulpitis with symptomatic apical periodontitis and after discussing with patient root canal treatment of 24 was initiated.

After rubber dam isolation of 24, access opening was done under local anaesthesia (2% lignocaine with 1:80,000 Adrenaline, Xicaine, ICPA Health Product Ltd., India). Expecting two buccal canals, the access opening was made mesiodistally wider than normal on the buccal aspect making a triangular outline for proper visualization of the canals. All three canals were explored with # 10 K file. Working length was determined with electronic apex locator (Eighteenth Medical E-Pex Pro, Orikam, India) and was confirmed with IOPA X-ray [Figure 2]. The three canals were cleaned and shaped using MANI K-files till size 20. After this canals were instrumented sequentially with NeoEndo flex rotary files (Orikam, India) till size 25.4%. While instrumenting canals were lubricated with AvuePrep EDTA gel (Dental Avenue, India) and irrigated with 3% sodium hypochlorite (Prime Dental products,

India) and 0.9% normal saline (Baxter, India). The canals were dried with paper points and filled with Calcium hydroxide paste with iodoform (NEOPEX, Orikam, India) [Figure 3]. The access cavity was temporized with cotton wool and modified zinc oxide cement (Cavit), and patient was recalled after 7 days. Patient recalled after 7 days.

On recall the tooth was asymptomatic. Biomechanical preparation was completed using NeoEndo flex rotary files (Orikam, India) till size 35.4%. The root canals were dried with paper points, obturated using Gutta-percha with resin based sealer (AH Plus, Dentsply, Detrey, Konstanz, Germany) and the postobturation radiograph was taken [Figure 4]. The access cavity was then sealed with modified zinc oxide cement (Cavit), and restored with composite after 3 days. The patient was then delivered a full coverage restoration.



Figure 1: Preoperative X-ray of maxillary 1st premolar showing two separate buccal roots and one palatal root



Figure 2: Working length X-ray showing files in two buccal canals and one palatal canal



Figure 3: Intracanal calcium hydroxide with iodoform medicament placed



Figure 4: Postobturation X-ray showing maxillary first premolar with two separate buccal canals and one palatal canal

Case 2

A 25-year-old male patient reported with the complaint of pain in his upper right posterior region since 2-weeks. On clinical examination, a distoproximal caries lesion was detected on maxillary right first premolar (14), the premolar was tender on percussion. An intraoral periapical radiograph revealed distoproximal radiolucency of the crown extending close to the pulp chamber of 14 [Figure 1]. Intraoral periapical (IOPA) X-ray also revealed a complex radicular anatomy with two buccal roots and a separate palatal root for 14. Electric pulp testing also was done, and 14 exhibited a delayed response. Maxillary right first premolar (14) was diagnosed with irreversible pulpitis and after discussing with patient root canal treatment of 14 was initiated.

After rubber dam isolation of 14, access opening was done under local anesthesia (2% lignocaine with 1:80,000 Adrenaline, Xicaine, ICPA Health Product Ltd., India). Expecting two buccal canals, the access opening was made mesiodistally wider than normal on the buccal aspect making a triangular outline for proper visualization of the canals. All three canals were explored with # 10 K file. Working length was determined with electronic apex locator (Eighteenth Medical E-Pex Pro, Orikam, India) and was confirmed with IOPA X-ray [Figure 2]. The three canals were cleaned and shaped using MANI K-files till size 20. After this canals were instrumented sequentially with NeoEndo flex rotary files (Orikam, India) till size 35.4%. While instrumenting canals were lubricated with AvuePrep EDTA gel (Dental Avenue, India) and irrigated with 3% sodium hypochlorite (Prime Dental products, India) and 0.9% normal saline (Baxter, India). The root canals were dried with paper points, obturated using Gutta-percha with resin based sealer (AH Plus, Dentsply, Detrey, Konstanz, Germany) and the postobturation radiograph was taken [Figure 4]. The access cavity was then sealed with modified zinc oxide cement (Cavit), and restored with composite after 3 days. The patient was then delivered a full coverage restoration.



Figure 1: Preoperative X-ray of maxillary 1st premolar showing two separate buccal roots and one palatal root

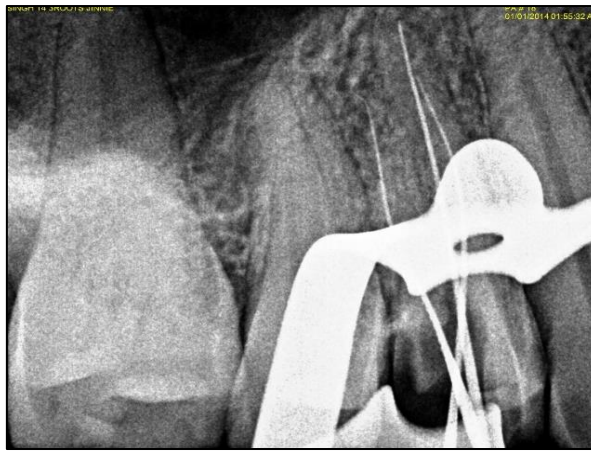


Figure 2: Working length X-ray showing files in two buccal canals and one palatal canal



Figure 3: Postobturation X-ray showing maxillary first premolar with two separate buccal canals and one palatal canal

Discussion

One of the major challenges in endodontic therapy is to treat teeth with variable anatomic configurations. Root canal treatment has shown that the pulp cavity is highly variable, making each treatment unique. Therefore, thorough knowledge of usual anatomy and less common variations is extremely important. Even though the literature shows that the incidence of a three-rooted premolar is quite low, it is important to not overlook this anatomic variation [5,6]. The careful examination of pre-operative radiographs is essential. In case of a doubt regarding possible variations in dental anatomy, two diagnostic X-ray images are recommended. If suddenly the X-ray image of a wide and well-shaped root canal narrows or disappears, it is assumed that there is a special root anatomy and probably a split of the root canal [7,8]. Clinical management involving maxillary first premolar teeth with unpredictable root morphology may pose some challenges that include difficulty in dental extraction, orthodontic movement and frequent failure of endodontic treatment.

In both the cases, diagnostic periapical radiography revealed a three separate rooted maxillary first premolar. The three canalled maxillary premolar requires a 'T' shaped access cavity modification which allows good access to each of the two buccal canals [11]. As suggested by Balleri et al. [12] a cut at the bucco-proximal angle, from the entrance of buccal canals to cavo-surface angle, was made in the present cases. So the outline of endodontic cavity was formed [14]. Hand files used to create path for rotary files system and canal preparations completed with NeoEndo flex rotary NiTi file. Calcium hydroxide was used as an intracanal medicament because its effect on persistent microbial species. Siqueira et al. showed calcium hydroxide can eliminate cultivable bacteria which single %2.5 NaOCl irrigation could not eliminate [10].

In straight-on radiographs of maxillary premolars, it was reported by Sieraski et al. [13,14] that whenever the mesio-distal width of the mid-root image was equal to the mesio-distal width of the crown or greater than it, the tooth probably has three roots.

Conclusion

Variations in the root canal anatomy is always a challenge for an endodontic treatment if it is miss diagnosed. Endodontists should always consider the possibility of unusual number of roots and canals to overcome infections and related symptoms. Therefore, a thorough knowledge and with proper techniques such as taking radiographs at various angulations for diagnosing the anatomical variations and access cavity refinements may be required for stress-free entry to complex anatomy. Correctly reaching all of the root canals, cleaning and shaping followed by a hermetic filling, are necessary for successful root canal treatment giving a more favorable outcome.

Conflicts of interest

The author deny any conflicts of interest related to this study.

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