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Case Report

Multirooted Bilateral Maxillary First Premolars - A Rare Anatomical Variation: Case Report

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Abstract

The success of endodontic therapy is mainly dependent on understanding the morphological anatomy of the tooth structure. Maxillary first premolars show a complex internal anatomy due to their variation in canal configuration and the number of roots. The bilateral presence of three roots in a maxillary first premolar is a rare occurrence. This case report describes the endodontic management of bilaterally three-rooted maxillary first premolars, with emphasis on the importance of radiographic interpretation and use of advanced endodontic armamentarium, including ultrasonic instruments, microdebrider, and micro-opener used under illumination and magnification provided by the dental operating microscope when handling these cases.

Key words: Bilateral, Premolars, Three Roots, Internal anatomy

INTRODUCTION

Knowledge of common and aberrant pulp morphology is essential for appropriate diagnosis and treatment planning before commencing root canal treatment. Appreciating the complexity of the root canal system and modifying treatment protocols as a consequence of such intricacy establishes the roadmap to successful endodontics for such complex cases. The clinician must have a thorough understanding of common anatomy, appreciation of its possible variations, and be capable of identifying these variant teeth.

Radicular morphology of maxillary premolars has been extensively studied. Considerable variation in the number of canals and roots found in these teeth has been reported. Maxillary first premolars frequently exhibit two roots and two canals. However, up to 6% of these teeth possess three roots harboring one canal per root.

The literature reveals wide variations in internal morphology of maxillary premolars. The presence of extra canals and/or roots is an additional challenge. Maxillary first premolars have shown a variation in root canal morphology, but the presence of three roots is rare. This anatomic disparity is a big challenge. There appears to be a racial predisposition for the presence of bilateral occurrence and presence of two or more canals in maxillary and mandibular premolars.[1-3] The rarer the aberrations, the more likely it is to be bilateral in occurrence.[4]

From the early work of Hess and Zurcher (1925) to more recent times, a wide range of studies conducted on root canal anatomy have demonstrated anatomic complexities of the root canal systems. They all have emphasized on the fact that a root with tapering canal and a single foramen is an exception rather than a rule. The investigated samples were of different ethnic background, and it was found that variations in root canal configuration of three-rooted maxillary premolars are from 0% to 6%.[5]

The purpose of this article is to report as well as discuss the successful diagnosis and endodontic treatment for an unusual occurrence of multirooted bilateral maxillary first premolars.

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CASE REPORT

A 33-year-old male patient with a non-contributory medical history reported to North Jeddah Specialty Dental Center,

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Ministry of Health, with a chief complaint of "pain on chewing." On clinical examination, a defective temporary restoration on the occluso-distal surface was detected on maxillary right first premolar (#14). Maxillary left first premolar (#24) also clinically showed a broken coronal restoration with an exposed metal post. Both the teeth were sensitive to percussion. There was no swelling or sinus tract involvement in relation to both the teeth.

Intraoral radiographs revealed widening of periodontal ligament space and discontinued lamina dura, especially in the apical part of the buccal root of the tooth #14. AQ1 Deviation of buccal root filling of tooth #14 that indicates the presence of missed canal [Figure 1]. The periapical radiograph of tooth #24 showed short root canal filling with a broad mesiodistal width of buccal root and the periapical region appeared radiographically normal [Figure 2]. Both the teeth were diagnosed as previously treated with symptomatic apical periodontitis.

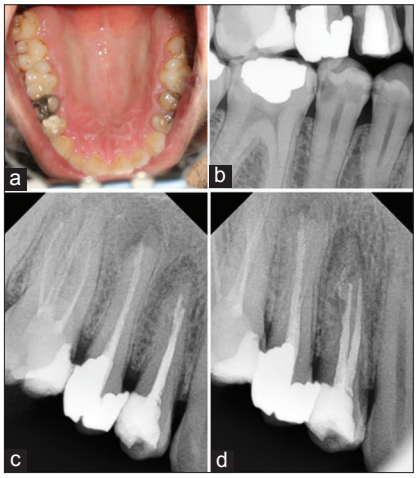

Figure 1: Maxillary right first premolar. (a) Pre-operative photograph of the upper jaw. (b) bitewingradiograph of the right premolar teeth. (c) Striaght periapical radiograph of the maxillary right firstpremolar. (d) Mesial periapical radiograph of the maxillary right first premolar

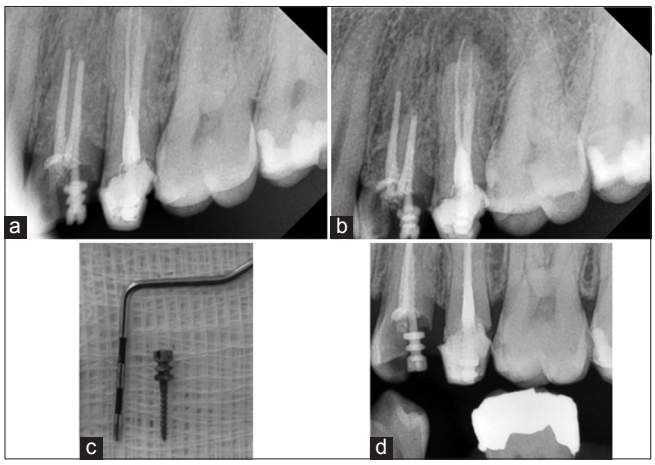

Figure 2: Maxillary left first premolar. (a) Striaght periapical radiograph. (b) Mesial periapicalradiograph. (c) Pre-operative photograph of the upper jaw. (d) bitewing radiograph of the right premolar teeth

Root Canal Treatment

After rubber dam isolation of #14, treatment was started under local anesthesia with 2% lignocaine with 1:80,000 adrenaline. Restoration and recurrent caries were removed followed by buildup of the distal wall using glass ionomer restoration (Ketac fil, 3M ESPE, Seefeld, Germany). The access cavity was modified, and old root canal filling was removed using ProTaper Retreatment Kit and hand files H-type (Dentsply, Maillefer, Switzerland). Even with the exploration of the access cavity, no other orifices were found. Under digital operating microscope and using micro-opener (Dentsply, Maillefer, Switzerland), missed distobuccal canal was successfully detected, and with the help of microdebrider (Dentsply, Maillefer, Switzerland), the dentin triangle was removed to create straight-line access to the distobuccal canal [Figure 3]. Working length was determined using Root ZX Apex Locator (J. Morita USA) which was confirmed by radiograph [Figure 3]. The canals were instrumented using profile rotary files and irrigation by NaOCl 5.25%. The root canals were dried using paper point. A $Ca(OH)_2$ dressing was placed in the canals and access was sealed IRM. The patient was scheduled for next appointment after 1 week.

After 1 week, the patient reported with no symptoms. After the application of rubber dam, IRM restoration was removed followed by the removal of $Ca(OH)_2$. The canals were lightly instrumented and irrigated with sodium hypochlorite with a final rinse with 17% ethylenediaminetetraacetic acid (EDTA). Canals were dried using paper point. Obturation was done with ZOE sealer and continuous wave compaction [Figure 4]. IRM was used to seal the floor of the chamber, and the tooth was restored with glass ionomer. The patient was advised for a full coverage crown.

The patient was recalled after 2 weeks for the retreatment of #24. After anesthesia with 2% lignocaine, preexisting restoration and recurrent caries were removed. Ultrasonic was used with SS tip to retrieve the post. AQ2 Buildup of distal wall was performed using glass ionomer restoration (Ketac fil, 3M ESPE, Seefeld, Germany) to ensure proper isolation. Rubber dam isolation and access cavity were modified which revealed only two canals. Removal of old root filling was done using ProTaper Retreatment Kit (Dentsply, Maillefer, Switzerland) and hand files H-type (Dentsply, Maillefer, Switzerland). Under dental operating microscope (DOM), a micro-opener (Dentsply, Maillefer, Switzerland) was used

to detect the missed DB canal, and then, microdebrider (Dentsply, Maillefer, Switzerland) was used to remove the dentin triangle and create straight-line access to the distobuccal canal. Working length determination was determined using Root ZX Apex Locator (J. Morita USA) and was confirmed by radiograph [Figure 5]. The canals were instrumented using proFILE Rotary Files and irrigation by NaOCl 5.25% with a final rinse with 17% EDTA. The root canals were dried using paper point. Obturation was done with ZOE sealer and continuous wave compaction [Figure 6]. IRM was used to seal the floor of the chamber, and the tooth was restored with glass ionomer. The patient was advised for a post and core and full coverage crown. Endodontic recall was done in 6 months [Figure 7].

DISCUSSION

Awareness of variation in internal anatomy in maxillary premolars and applying this knowledge in clinical interpretation and radiographs are a sign of good clinician. A three-dimensional determination of the internal structure of teeth, number of root canals, and root form is a challenge. Furthermore, due to the complex, varied morphology of the premolars, it is a challenging task to do an endodontic treatment in these teeth. Accurate pre-operative radiographs, straight and angled, using parallel technique is essential in providing clues as to the number of roots that exist.[9]

The anatomy of maxillary premolars with three root canals, mesiobuccal, distobuccal, and palatal, is similar to that of adjacent maxillary molars, and they are, therefore, sometimes called "small molars" or "ridiculous."[10] A radiograph revealing an unusual contour and atypical tooth shape; the clinician should take extra radiographs with different angulations to confirm any unusual anatomical features. When there is an abrupt straightening or loss of a radiolucent canal in the pulp cavity, an extra canal should be suspected in the same root or in the other independent roots.[10,11] If the mesiodistal width of the mid-root image is equal to or greater than the mesiodistal width of the crown, the tooth most likely has three root canals. Yoshioka *et al.*[11] indicated that sudden narrowing

Figure 3: Working length radiograph of the maxillary right first premolar. (a) Straightperiapical radiograph. (b) Mesial periapical radiograph

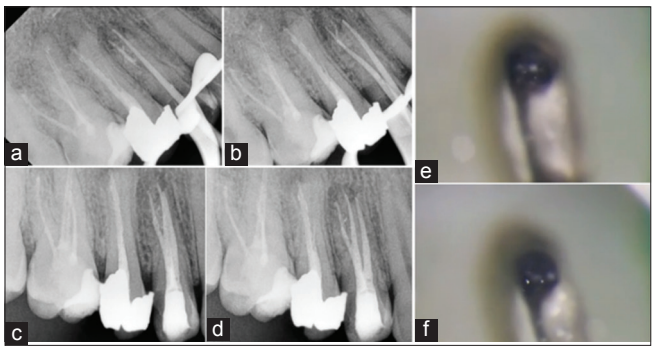

Figure 4: Maxillary right first premolar. (a and b) Periapical radiograph of match cone fit. (c and d)Final radiograph. (c) Straight periapical radiograph. (d) Mesial periapical radiograph. (e and f)Photograph of buccal orifice showing MB and DB canals

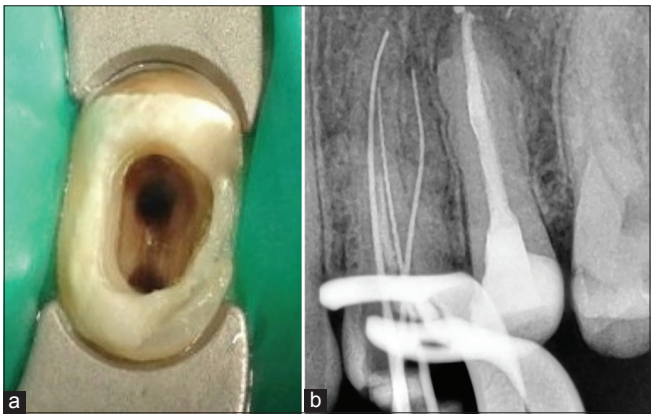

Figure 5: Maxillary left first premolar. (a) Photograph of access cavity. (b) Workinglength periapical radiograph

Figure 6: Maxillary left first premolar. Final post-operative radiograph (a) Periapical radiograph(mesial shift). (b) Periapical radiograph (straight)

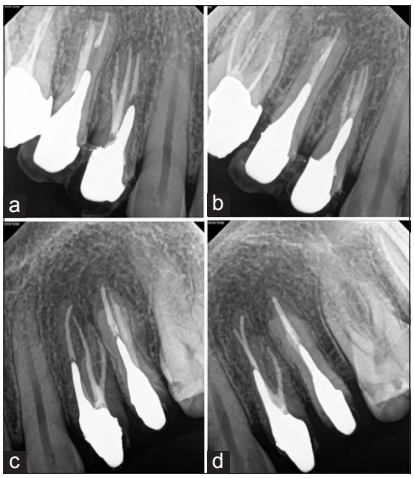

Figure 7: (a and b) 1-year recall periapical radiograph of the maxillary right first premolar. (c and d)1-year recall periapical radiograph of the maxillary left first premolar

of canal system (fast break rule) on a parallel radiograph suggests canal system multiplicity. In the study conducted by Sabala *et al*.,[13] on patients for aberrant root and root canal morphology, the occurrence of the same aberration on the contralateral tooth varied according to the type of anomaly. The study was conducted on 501 patients, and of these, four patients were having three-rooted maxillary first premolars. It was also found that, in all these four, the three-rooted premolars were bilateral. The study concluded that the rarer the anomaly, the greater the incidence of the anomaly occurring bilaterally.

Due to its enhanced visibility and lighting, the DOM is increasingly being used *in vivo* during routine endodontic procedures.[14] The reported advantages of using an operating microscope for conventional endodontics include improved visualization of root canal anatomy that enables the operator to investigate the root canal system and to clean and shape it more efficiently.[14,15] The detection rate of root canal orifices under a microscope was significantly higher than that with the naked eye and that the use of surgical loupes was relatively ineffective compared with the microscopic method.[16]

The use of different angled radiograph and microinstrument under DOM will help the clinician to reach accurate diagnosis and treatment.

CONCLUSION

Thorough knowledge of morphological variations in pulpal anatomy, careful interpretation of radiographs, proper access cavity preparation, and location of root canal are an ideal requisite for the success of endodontic treatment. The maxillary first premolars are among the most difficult teeth to be treated endodontically. The use of an operating microscope or loop can enhance the visualization of the pulp chamber and extra canal orifices.

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