DIAGNOSIS AND ROOT CANAL TREATMENT OF A THREE-ROOTED MAXILLARY PREMOLAR: A CASE REPORT

Abstract
Proper knowledge of the root canal morphology and variations is a prerequisite for successful endodontic treatment. One of the challenging tasks facing clinicians is performing proper endodontic therapy for a maxillary first premolar because the root and canal system of these teeth can vary significantly among different racial and ethnic groups. This case report describes the presence of three roots occurring in maxillary first premolar, drawing particular attention to radiographic interpretation and access refinements. The case report emphasized the importance of complete knowledge about root canal morphology and possible variations, along with clinical and radiographic examination in order to increase the ability of clinicians to treat difficult cases.

Keywords: Anatomic variation, maxillary premolar, root canal morphology.

Introduction
The most important factor responsible for the root canal failure is incomplete cleaning and shaping of the root canals. Although three rooted maxillary premolars are rare but the possibility of extra roots or canals should be borne in mind to ensure successful endodontic treatment. Studies have shown low incidence of three root canals in maxillary premolars\(^1\). The treatment of maxillary premolar with extra root or canal is an endodontic challenge at all steps starting from diagnosis to access refinement and proper instrumentation. Although radiographs provide a two-dimensional image of a three-dimensional object but its correct interpretation plays a very important role to detect extra root/canal. A general guideline for the identification of a three-rooted maxillary premolar on a straight-on preoperative radiograph is if the mesial-distal width of the mid-root image appears equal to or greater than the mesial-distal width of the crown image, then the tooth most likely has three canals. This guideline acts as a good visual clue, but is not absolute. Multiple radiographs should be taken at different angulations if an extra root or the root canal is suspected. Failure to detect the extra root canal can produce continuous post-operative pain and discomfort in patient. This case report describes the successful diagnosis and treatment of a patient with three-rooted maxillary first premolar.

Case-report
A 21 year old male patient reported in the postgraduate clinic of Department of Conservative Dentistry and Endodontics, Institute of Dental Sciences, Bareilly, U.P. The chief complaint of the patient was pain on chewing in the maxillary left premolar region and sensitivity to hot and cold. Clinical examination revealed deep caries in maxillary left first and second premolar and exposing the pulp. The electric pulp tester (DIGITEST, Parkell Electronics Division, Farmingdale, NY) elicited early response as compared to the adjacent unaffected tooth, pointing the diagnosis towards acute irreversible pulpitis in both premolars. Periapical radiographs were taken, which showed large carious lesion in both premolars and an unusual anatomy of maxillary first premolar. Three distinct roots were observed in maxillary left first premolar resembling the maxillary first molar (Figure 1). Maxillary first premolar was anaesthetized and access cavity was prepared under rubber dam isolation. The pulp chamber was deep, the palatal and mesiobuccal canal orifices were located easily with #10 k-file (Dentsply Maillefer) but the distobuccal canal orifice could not be located initially. The access cavity was enlarged distobuccally using an Endo-Z bur (Dentsply Maillefer, Ballaigues, Switzerland) to locate the distobuccal canal orifice, which was finally located at a distance from mesiobuccal orifice with #10 k-file. Working length was measured with Root ZX electronic apex locator (J. Morita Corporation, Tokyo, Japan) and was confirmed by taking the periapical radiograph (Figure 2). Biomechanical preparation was done with hand instruments till #15 k-file (Dentsply Maillefer) and then in crown down manner with rotary NiTi files (Protapers, Dentsply, Maillefer, Swiss made CH-1338 Ballaigues) with frequent irrigation using 17% EDTA (Glyde File Prep, Dentsply Maillefer) and 2% sodium hypochlorite (Figure 3). Obturation was done with gutta-percha (Dentsply Maillefer) and AH Plus sealer (Dentsply DeTrey GmbH, Germany) using cold lateral condensation and the teeth was restored with resin composite (Figure 4). Root canal treatment was also performed in maxillary left second premolar and restored with resin composite (Figure 4).

Discussion
The variability of the root canal system of multirooted teeth represents a challenge to both endodontic diagnosis and treatment. Anatomic variations can occur in any tooth but the clinician should be aware of it and should have a complete knowledge of it to avoid any mishap during root canal treatment\(^2\). Periapical radiographs should be studied carefully as they are good indicators for any morphologic or anatomic
variations in a tooth\textsuperscript{5}. Two or more radiographs must be taken at mesial and distal angulations to detect any extra root/canal. Undetected extra roots or root canals are a major reason for failure of root canal treatment. Therefore accurate evaluation of pre-operative radiographs is essential to detect an extra root/canals\textsuperscript{5}. Whenever there is a sudden straightening or loss of a radiolucent canal, an extra canal should be suspected that could be in the same root or in other, independent roots\textsuperscript{5}. Here in this case, three separate roots were observed in the periapical radiograph. These type of maxillary premolars with three root canals, palatal, disto-buccal and mesio-buccal, very similar to the maxillary molar are often termed as 'small molars' or 'radiculous'. In treatment of three rooted maxillary first premolars a T-shaped access outline should be made. Slight modification of the access cavity is required to locate the canal orifice in teeth with complex anatomy as in this case\textsuperscript{6}. The location of the buccal orifices makes the treatment of such teeth difficult as sometimes they are very close to each other and sometimes they are at a distance which makes them difficult to locate\textsuperscript{6}. Keeping all these factors and suggestions in mind a clinician can avert the failure of root canal treatment in such challenging cases.

**Conclusion**

A proper knowledge of the root canal anatomy and variations is necessary for successful root canal treatment in such cases. Careful interpretation of radiographs coupled with access refinement and inspection of the pulpal floor can play a very important role for management of these types of anomalies.

**References**