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Endodontic treatment of three-rooted maxillary first premolar: A case report



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ABSTRACT

A meticulous knowledge of the tooth morphology, careful interpretation of angled radiographs, proper access preparation and a detailed exploration of the interior of the tooth are prerequisites for a successful treatment outcome. False assumption about root canal morphology may lead to incomplete debridement and obturation of root canal space eventually leading to endodontic failures.

Maxillary first premolar is known for the greatest variations in root anatomy and root canal morphology, while presence of two roots with two canals is quite common and is considered normal. The incidence of first maxillary premolar with three roots & three canals is quite rare and has been reported to 0–6% by Carns and Skid.

This case report discusses the diagnosis and treatment of a maxillary first premolar with three canals and three separate roots. The presence of three roots with three canals was detected by radiographic interpretation, access refinements and confirmed by using spiral computed tomography.

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1. Introduction

An in-depth knowledge of the internal anatomy of a tooth canal relationship is deemed necessary before performing any endodontic therapy. As it is rightly stated, 'what you know, so you see', it is important to visualize the internal morphology as difficulties found in RCT are due their variations. Even treatment of uncomplicated multirooted tooth may surprise an operator with possible anatomical variations. Root canals are sometimes left untreated because a dentist fails to identify their presence, particularly in teeth that have anatomical variations or additional root canals. Careful interpretation of preoperative radiographs taken at different angles may eliminate this confusion.

The most recent studies demonstrating anatomic complexities of the root canal system had established that a root with a tapering canal and a single foramen is the exception rather than the rule.[1]

Maxillary first premolar exhibits the greatest variation in root anatomy and root canal morphology.[1] These variations in number and type of root canals are probably some of the most widely described anomalies in the literature. The presence of two canals must be considered normal, but racial differences in the root canal morphology of premolars have been established.[2]

The incidence of maxillary first premolar with one root varied from 22.0% to 49.4%; two roots, 50.6%–72%; and three roots, 0–6% (Carns and Skid,[3] Kartal et al,[4] Loh,[5] Bellizzi & Hartwell,[6] Vertucci and Gegauff[7]).

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A recent study on 150 extracted maxillary first premolars from citizens of Seville, Andalusia, southern Spain, revealed 60 teeth with one root (40.0%), 85 teeth with two roots (56.7%) and five teeth with three roots (3.3%).[8]

The present case report discusses the diagnosis and successful treatment of a three-rooted maxillary first premolar.

2. Case report

A 24-year-old male patient reported to the Department of Conservative Dentistry and Endodontics, Modern Dental College & Research Centre, Indore, complaining of severe pain with his upper left tooth region. The tooth had been endodontically treated by a general dentist which on examination of his IOPA revealed inadequate root canal obturation with only a single canal been obturated short of apex and radio-opaque coronal restoration. Further, IOPA revealed an unusual anatomy of the root with periapical radiolucency with the involved first premolar tooth (Fig. 1). Clinical examination revealed a fractured tooth coloured restoration and fractured palatal cusp up to gingival level. His medical history was non-contributory. It was decided to re-treat the tooth.

The coronal restoration and previous root canal filling was removed. Access cavity was modified. Closed dressing of modified zinc oxide cement (Cavit) was applied. As the preoperative radiograph showed unusual root anatomy, to investigate further, spiral computed tomography (SCT) scan of the area of interest was performed (Fig. 2).

In order to gain access to the palatal tooth margins which was fractured up to gingival level, crown lengthening by gingivectomy was performed on the palatal aspect. The patient was recalled after 1 week, cusp wall was built up on the palatal side with composite restoration.

Root canal therapy was initiated under rubber dam and access opening revealed three canals. The access opening was modified to a triangular outline for proper visualization of the canals (Fig. 3).

All three canals were explored with # 10 K file. The working length was measured on the radiograph which was subsequently confirmed by the apex locator (Fig. 4). The root canals were prepared manually by a # 20 K file. The remaining preparation was completed with rotary files (Protaper system) with copious irrigation using 5.25% NaOCl.

Coronal flaring was carried out using the Gates Glidden Drill nos. 1–3 followed by SX of the Protaper Kit. Copious irrigation was done using 2.5% hypochlorite and saline. RC prep was used as the lubricating agent since the canals were

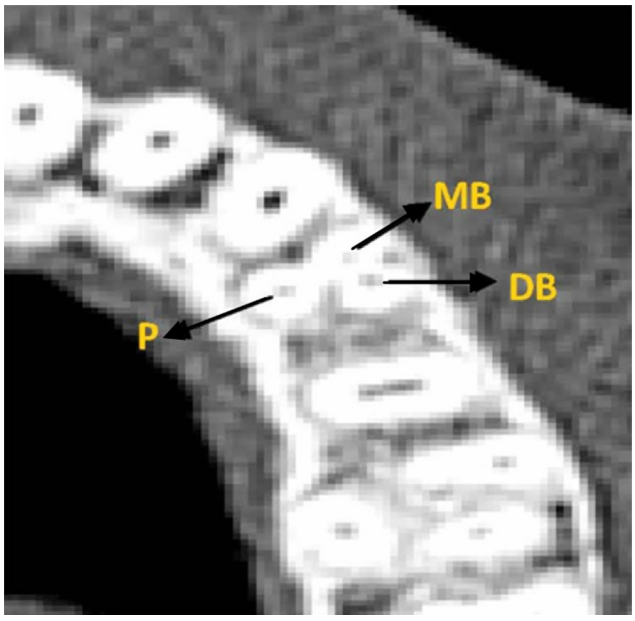


Fig. 2 – CBCT image of showing axial section.



Fig. 1 – Diagnostic film showing poor obturation and missed canal in tooth # 24.

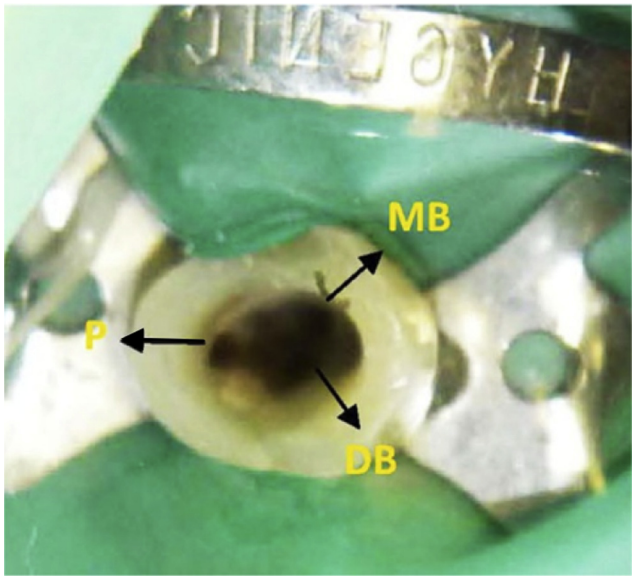


Fig. 3 – Access opening showing three root canal orifices.



Fig. 4 – Establishing the working length.

fine towards the apex. The canals were dried with paper points and filled with calcium hydroxide paste. The access cavity was temporized with cotton wool and modified zinc oxide cement (Cavit), and patient was recalled after 7 days.

On recall the tooth was asymptomatic. Biomechanical preparation was completed till F2 of the Protaper kit. The preparation was further refined using # 25 H file. The root canals were dried with sterile paper points and obturated by laterally condensed gutta-percha and resin based root canal sealer (AH Plus). Modified zinc oxide cements (Cavit) was used to close the access cavity for another week (Fig. 5).



Fig. 5 – X-ray following the obturation of the three root canals.



Fig. 6 – Restoring the tooth with casted post and core after 1 week.

On recall, the tooth was found asymptomatic, it was restored with cast post and core with palatal root (Fig. 6) and ceramo-metal crown (Fig. 7).

On recall after six-month following endodontic treatment the tooth remained asymptomatic upon clinical and radiographic examination (Fig. 8).

3. Discussion

The main goal of root canal therapy is thorough cleaning and shaping of pulpal spaces and its complete obturation with an



Fig. 7 – Metal ceramic crown placement.

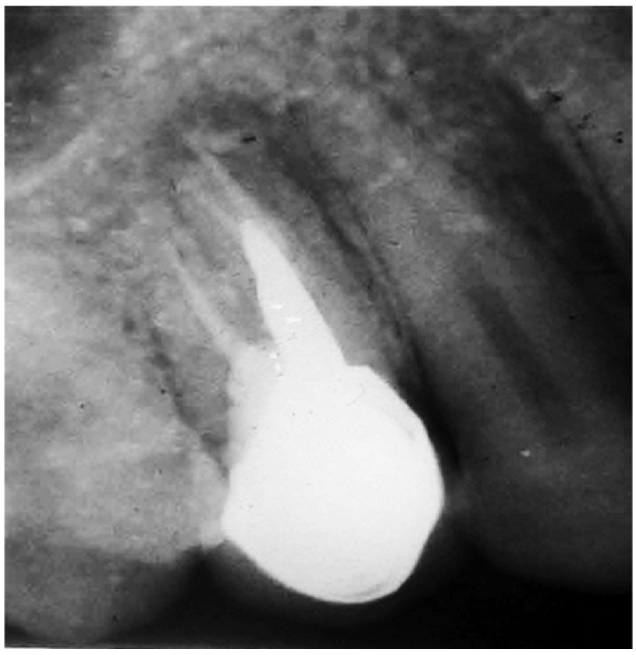


Fig. 8 – Radiographic examination of the tooth approximately 6 months later.

inert filling material. The presence of an untreated canal, inadequate debridement and incomplete obturation of the root canal system were found to be common reasons for failure.[9]

The diagnosis of additional roots or canals in maxillary premolars can often be difficult using routine IOPA; therefore, the preoperative radiographs should be carefully examined for extra root canals or perforations if any to avoid unsuccessful endodontic treatment.[10] While periapical radiographs show two-dimensional images of three dimensional root canal systems, the careful interpretation of a radiograph may reveal anatomical details of a root canal system. In line with this suggestion, if a radiograph shows a sudden narrowing or even a disappearing pulp space, the canal diverges at that point into two parts that may either remain separate or merge before reaching the apex.[11] If the pulp chamber appears to deviate from normal configurations and seems to be either triangular in shape or too large on a mesio–distal plane, more than one root canal should be suspected.[12]

Routine radiographs produce only a 2D image of a 3D object, resulting in superimposition of images. Therefore, they are of rather limited value in cases with complex root canal anatomy. Interpretation and appraisal based upon a 2D radiograph may alert the clinician to the presence of aberrant anatomy but would not be able to present the exact variable morphologic structure of root canals and their interrelations.[13] It is therefore very important that clinicians use all of the armamentaria at their disposal to locate and treat the entire root canal system. SCT in such case could be of great help.

Therefore SCT of the involved tooth was done in the present case, as indicated by Ballal et al,[14] Gopikrishna et al,[15] and Sponchiado et al,[16] who used SCT for the confirmatory diagnosis of morphologic aberrations in the root canal anatomy.

Enhanced illumination and magnification with the aid of magnifying loops or microscopes could also help to visualize the treatment site and aid to locate root canal orifices. The higher magnification and illumination can be useful for access cavity preparation, instrumentation and obturation.[17]

4. Conclusions

Teeth with anatomical variations present a challenge for clinicians and will risk the success of endodontic treatment due to the fact that unlocated roots or canals will compromise the treatment. A careful, detailed inspection of the pulp chamber floor is a helpful procedure for locating suspected roots or canals. Another important aid in locating root canals is the routine use of loops and dental operating microscopes to enhance lighting and visibility.[17] The importance of SCT as an objective analytical tool to ascertain root canal morphology is nevertheless indispensable. Thus the judicious diagnosis of the case through the current efficient imaging systems, meticulous obturation technique and competence of operator need not be overemphasized.

Conflicts of interest

All authors have none to declare.

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Addendum

In the secretary PFA's report on 27th Annual convocation and awards ceremony published in December 2013 issue of JPFA, list of PFA senior student awardees, that of PFA student undergraduate certificate of merit and PFA international certificate of merit were missed inadvertently. The same may be read as under. Inadvertent omission is regretted.

Chief Editor.

III. PFA International Senior Student Awards

1. Ms. Kanika Sabhlok
   Manipal College of Dental Sciences, Manipal
2. Mr. Samarth Vajpayee
   Rishiraj College of Dental Sciences, Bhopal
3. Ms. Devika R Krishnan
   Amrita School Dentistry, Cochin
4. Mr. Vaibhav Kumar
   KLE Institute of Dental Sciences, Belgaum
5. Ms. Jacqueline Jacinta
   SRM Dental College, Chennai
6. Mr. Hardik Makkar
   JSS Dental College, Mysore
7. Ms. Suchita Kothari
   KSR Institute of Dental Sciences, Tiruchengode
8. Ms. Pooja Balaji Muley
   Government Dental College, Aurangabad
9. Mr. Kundan Shah
   Bangalore Institute of Dental Sciences, Bangalore
10. Ms. Anooja Lall
    Dr. HS Judge Institute of Dental Sciences, Chandigarh

IV. PFA Student Undergraduate Certificate of Merit

Ms. Saniya Setia
Gian Sagar Dental College, Patiala

V. PFA International Certificate of Merit

Dr. S.S. Dua, Chandigarh