CONE BEAM-COMPUTED TOMOGRAPHY AS AN INDISPENSABLE TOOL IN THE MANAGEMENT OF RADICULOUS PREMOLAR: A CASE REPORT

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ABSTRACT

Background: Internal anatomy of maxillary first premolars is particularly multifaceted on account of the variation in number of roots and canal configuration. Maxillary first premolars with 3 roots are called as small molar or "radiculous" because of their similar anatomy to the maxillary first molars. The most demanding step in endodontic treatment is identification and proper access to pulp canals of certain teeth with atypical canal configurations. Methods of identification of such premolars can be by various aides.

Case Presentation: The present case describes the application of Cone Beam-Computed Tomography in the diagnosis of extra root with extra canal in a three rooted maxillary right first premolar.

Conclusions: Proper knowledge of the anatomical variations is a must for an endodontist to make a treatment successful. Utilizing the latest technology along with the traditional concepts can surely rule out the inaccuracy in the treatment involved in such cases.

KEYWORDS: cone beam-computed tomography, maxillary first premolar, radiculous premolar, root canal morphology

INTRODUCTION

The key to successful endodontic treatment lies in the dentist's ability to know the tooth anatomy very well. The most demanding step in endodontic treatment is identification and proper access to pulp canals of certain teeth with atypical canal configurations[1].

Internal anatomy of maxillary first premolars is particularly multifaceted on account of the variation in number of roots and canal configuration. Vertucci and Gegauff found 5% of 400 maxillary first premolars have single canal, 0.5% as single canal in single root, 0.5% existed as 2 canals in 2 roots and 4% existed as one canal in each of the three separate roots[2]. A study by Momen on Saudi population showed that of the 246 extracted first premolar teeth that were studied only 1.2% showed three roots (Vertucci's classification class IX)[3,4]. The highest incidence (6%) was determined by Carns and Skidmore on 100 plastic casts of the root canals of maxillary first premolars[5]. Maxillary first premolars with 3 roots are called as small molar or "radiculous" because of their similar anatomy to the maxillary first molars[3]. Methods of identification of such premolars can be by various aides; if the mesio-distal width of mid root image

seems equal to or greater than mesio-distal width of the crown in straight on radiographs, the tooth possibly may have 3 roots. Use of operating microscope is said to significantly increase the detection rate of such cases. Third and the most promising method of identification is Cone Beam-Computed Tomography (CBCT), it is well suited for craniofacial region[2]. In the present case CBCT has been utilized in the diagnosis of extra root with extra canal in a three rooted maxillary right first premolar.

CASE REPORT

A male patient aged 29 years with a non-contributory medical history visited the emergency clinic in the Department of Conservative Dentistry and Endodontics with chief complaint of pain in the upper right back region of the mouth since 5-6 days. Pain was sharp and intermittent in nature which aggravated on taking hot food and drinks. Patient also complained of pain during sleep.

Clinical examination revealed a large coronal carious lesion seen in relation to tooth with no evidence of swelling or sinus tract. Pulp vitality testing was done with electronic pulp tester which showed a hyper response; and the pain even lingered on after removal of the stimulus. On careful examination Intra Oral Periapical Radiograph (IOPA) revealed large radiolucency in the crown of tooth 14 involving enamel, dentin and pulp with widening of the periodontal ligament space. A great mesio-distal width was observed in the middle third of the root associated with complex root morphology. Based on clinical and radiographical evidence it was diagnosed as acute irreversible pulpitis in relation to tooth 14 (Figure 1).

The treatment procedure was started by administering local anaesthesia and isolation with rubber dam (Hygienic, Coltene). Access opening was done with the help of endo access bur and by a cut at the bucco-proximo angle the access cavity was modified at the entrance of the buccal canals to the cavo-surface angle. The resulting cavity was T-shaped which was made using endo Z bur (Figure 2).

Figure 1. Intraoral periapical radiograph showing three roots and three canals in relation to 14.

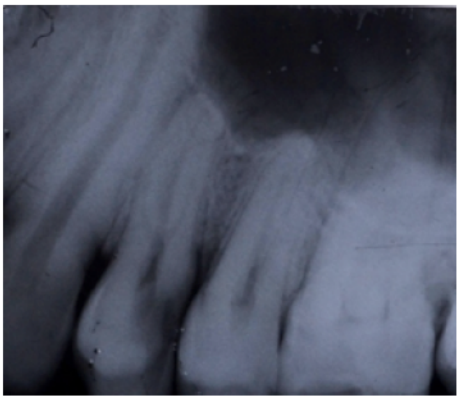

Figure 2. T-Shaped outline of the access opening in 14.

A CBCT was taken after this procedure to confirm the number of roots and the level of bifurcation of the canals (Figure 3). Images taken at different planes showed the exact location of the root apices. MB and DB canals were explored with size 10 K File (Dentsply Maillefer, Switzerland) and palatal canal with a size 15 K File (Dentsply Maillefer, Switzerland). Working length was established with apex locator (Propex II, Dentsply Maillefer, Switzerland) and radiographically it was confirmed. Gates Glidden Drills were used for the coronal flaring (Dentsply Maillefer, Switzerland) size 50, 70, 90 to achieve straight line access. Remaining root canal system was prepared by Rotary Protaper Files (Dentsply Maillefer, Switzerland) using Glyde (17% ethylenediaminetetraacetic acid, Dentsply) root canal lubricant. Alternate irrigation of 2.5% NaOCl and saline was done copiously.

Canals were dried with paper points and closed dressing using Coltosol (Dentsply) was given with calcium hydroxide as a medicament and patient was recalled after 7 days. Preparation of buccal canals was done till protaper file F2 and palatal canal was prepared till protaper file F3 and final irrigation of 2% chlorhexidine was done. Canals were dried with protaper paper points and obturation of the canals was done with Protaper Gutta Percha cones along with AH Plus (Dentsply Maillefer, Switzerland) as a sealer. Post endodontic restoration was done with composite on the same day (Figure 4).

Figure 3. CBCT image (Axial view) in relation to tooth 14 confirming three different roots.

DISCUSSION

Maxillary premolars can be considered as the most difficult teeth to

be treated endodontically for a range of reasons like -the number of roots, diverse pulp cavity configurations and also problems in visualization of the apical limit by the radiographs. Use of CBCT along with intraoral periapical radiographs and operating microscope can prove a boon in such cases. In this case CBCT helped in the identification of the extra root along with the extra canal along and exact location of root apices was aided which could not be appreciated clearly on intraoral periapical radiograph[6].

Figure 4. Obturation with post endodontic restoration done in 14.

Walton recommended the use of two intraoral periapical radiographs for the diagnosis, one in straight on view and other in mesial angulation[2]. If radiograph shows a sudden narrowing of the pulp space, the divergence of canal at that specific point into two parts can be anticipated which may either remain separate/merge before reaching the apex. A third canal in upper first premolar should be suspected clinically when pulp chamber is not aligned to expected bucco-palatal design. In order to get straight line access to all the canals and to achieve possible reduction of instrument separation and canal transportation, Balleri et al. recommended T shaped access outline[7]. K file may encounter obstruction and deflection during the initial placement before it can be explored further. When the bifurcation is present in the mid third of the root, canal entrance may be ovoid/ flattened in shape in bucco-lingual direction. Good illumination and magnification with good tactile sense is crucial at the moment. Precurving of K file is essential to avoid ledge formation. Recent studies have shown that the ProTaper system perfectly shapes curved and constricted canals[8-10]. The ProTaper instruments offer added and unique geometries as when sequenced and used correctly, afford extraordinary flexibility, efficiency, safety and simplicity. ProTaper instruments were able to shape constricted canals[11].

CONCLUSIONS

The rapid strides, expansion and quick commercialization of CBCT technology for imaging maxillofacial region will indisputably increase dental practitioner acumen to three Dimensional (3D) radiographic assessments in clinical dental practice. In a relatively short scanning time high diagnostic quality CBCT images will give the clinicians added advantage of better diagnosis and thereby better treatment and better prognosis[12]. Proper knowledge of the anatomical variations is a must for an endodontist to make a treatment successful. Utilizing the latest technology along with the traditional concepts can surely rule out the inaccuracy in the treatment involved in such cases.

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