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Endodontic Management of Mandibular Second Premolar Using Cone Beam Computed Tomography (CBCT): A Case Report

Monika Khangwal[1], Monika Khokhar[2], Mayank Arora[3],
Mitali Middha[4], Ravinder Solanki[5]

[1,2,3,4]Department of Conservative Dentistry and Endodontics, Post Graduate Institute of Dental Sciences, Rohtak (Haryana)
[5]Department of Oral and Maxillofacial Surgery, Post Graduate Institute of Dental Sciences, Rohtak (Haryana)

ABSTRACT

Aim- to present case of mandibular second premolar with two separate roots and two canal using cone beam computed tomography (CBCT).

Case Description – Mandibular premolar usually have single root with single canal. Variability in canal morphology with two separate roots and canal are extremely rare. The clinician should be astute enough to identify the presence of unusual numbers of roots and their morphology for successful endodontic treatment.

Conclusion – Endodontic management of mandibular second premolar with two separated root and canal has been presented. Radiographs produce two dimensional image of a three dimensional object resulting in superimposition of images. Hence CBCT supported toward the confirmation of variability and unpredictability of canal morphology.

Keywords- Mandibular second premolar, root canal morphology, cone-beam computed tomography.

INTRODUCTION

Accurate diagnosis and successful endodontic therapy is always a challenge due to the complexity of the root canal morphology. Therefore a thorough knowledge of root canal anatomy is necessary. Slowey has indicated that due to the variations in canal anatomy, mandibular premolars are the most difficult teeth to be treated endodontically; they have a high flare up and failure rates [1]. In a classic anatomical study, Zillich and Dowson showed the incidence of three canals in mandibular second premolars to be 0.4% [2]. Conventional intraoral periapical (IOPA) Radiograph due to its inherent limitation could not be the solely diagnostic tool for confirmatory canal configuration. Mandibular second premolar has been reported with four roots and four canal with the support of spiral computed tomography [3]. This case report presents the endodontic management of two separate roots and canal using CBCT.

CASE REPORT

A thirty five year old male patient of Indian descent was referred with the chief complaint of pain over one month in relation to lower right posterior teeth. History revealed episodes of sensitivity and spontaneous pain to hot foods in the involved toot. On Intra oral examination there was deep occlusal carious lesion with pulpal exposure in tooth #45. On the contralateral side mandibular first premolar showed no unusual anatomy in terms of number of cusps and dimension. Electric pulp test (Sybron Endo, USA) and heat test with a gutta-percha stick presented lingering response with provisional diagnosis of irreversible pulpitis.

Radiographic evaluation of involved tooth# 45 revealed an unusual complex root canal anatomy and vague outlines of two roots and two canals (mesial and distal). Additional IOPA at different angulations were performed to confirm the complexity of the canal configuration [FIGURE 1]. Due to the two dimensional imaging supportive confirmatory diagnosis of canal morphology could not be made. Hence, to assure this rare and complex root canal anatomy in three dimensional

imaging; CBCT was planed. Informed consent from patient was obtained and mandible was scanned using CBCT [FIGURE 2]. Once confirmatory diagnosis was done, endodontic treatment was planned. Access to the pulp chamber was attained after administration of local anesthesia (2% Lidocaine with 1:100,000 adrenaline) under rubber dam isolation. To gain sufficient access to the canals, the conventional access opening was modified into one that was wider buccolingually. On carefully exploration of pulpal floor with an endodontic explorer DG-16(Dentsply Maillifer, Ballaigues (VD) Switzerland) it was explored that the roots bifurcates at the middle third. After careful inspection and tactile sensation two canal orifices one from mesial side and other from distal side were located. Patency of the canal obtained using 10K- file. The working length was determined with files in the respective canal using radiographs (IOPA) [FIGURE 3]. The canals were cleaned and shaped sequentially with ProTaper files (Dentsply, Maillefer, USA), irrigated using 5% sodium hypochlorite and 17% ethylenediaminetetraacetic acid and a final rinse with saline. The canals were dried with paper points (Dentsply, Maillefer, USA), calcium hydroxide intracanal medicament was placed in the canal and Cavit (3M ESPE, St. Paul, MN, USA) was used to close the access cavity. One week later the canals were recapitulated, irrigated, dried and radiograph was taken with master cones in the entire canal. Finally canal were obturated with F1 ProTaper gutta-percha cones (Dentsply, Maillefer, USA) using AH Plus sealer (Dentsply, Maillefer, USA) [FIGURE 4]. The access cavity was restored permanently with composite resin restorative material (3M ESPE, USA). The patient experienced no post operative discomfort and subsequently porcelain fused metal crown was placed for proper esthetic and function [FIGURE 5].

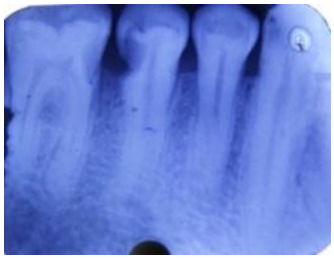

Figure 1- Intra oral radiograph showing two roots and two canals in relation to # 45

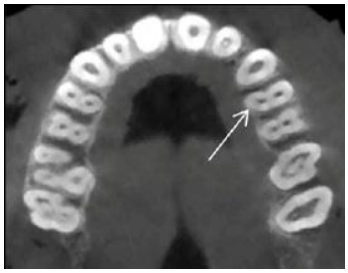

Figure 2- CBCT of apical third section of root # 45

FIGURE 3:- Intra Oral Radiograph Showing Working Length In Relation To # 45

FIGURE 4:- Intra oral radiograph showing obturated canals in relation to # 45

FIGURE 5:- Intra oral radiograph showing restoration along with PFM crown #45

DISCUSSION

Diagnosis and management of extra roots and canal are always challenging for endodontic. For successful endodontic treatment clinician should have thorough knowledge of the normal canal anatomy and its variation. Anatomic studies and clinically reported cases have documented anatomical variations of mandibular premolars[4,5,6,7,9]. Several cases have been reported with the flare up in mandibular premolars due missed root canals as mental foramen and neurovascular structures are in close proximity to the apices of mandibular premolars [8]. A study conducted by Ingle JI in 2003 at university of Washington assessed the result of endodontic therapy of mandibular premolars which showed 11.45% of failure rate [10]. Conceivably, these finding may be due to complexity of root canal morphology. Failure to identify complex canal configuration due to inherent limitation of radiographs question the success of endodontics therapy. Radiographs are of limited use in such cases as it produces two dimensional images of three dimensional objects leading to superimposition of the images. The advent of 3D imaging has provided sophisticated diagnostic tools for effective evaluation of root canal morphology and facilitated clinician interactive image manipulation and enhancement to visualize the area of interest [11]. Considering the fact that these teeth are presented with unpredictability and aberrations, it becomes mandatory that when patient approaches with flare up or sensitivity to hot and cold after endodontic treatment presence of missed canal must be suspected. In such complex cases judicious use of high end diagnostic tool must be considered.

A wide range of literature and opinions regarding variations of root canal anatomy has been reported [12,13]. Study performed by Ballal et al [14], Gopikrishanan et al [15],Robinson et al [16],Sponchiado et al [17], wherein spiral computed tomography (SCT) was used for confirmatory diagnostic tool to identify morphological aberrations of root canal anatomy. Clinical inspection of the pulpal floor, proper access opening and advance diagnostic tools are essential for successful treatment outcome.

CONCLUSION

It is well established that the anatomic variation can occur in these teeth. Through knowledge about the anatomic variations of morphology and careful observation of radiographs are essential for the location and identification of additional roots and root canals which can be facilitated by using operating microscopes, CBCT and SCT for successful treatment.

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