Management of Independent Middle Mesial Canal in Mandibular First Molar Using Cone Beam Computed Tomography Imaging as an Adjunct – A Case Report

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ABSTRACT

The primary objective of root canal therapy is adequate biomechanical preparation of root canal system followed by 3D obturation.in clinics we are encountered with several anatomical variations, which we need to manage efficiently. One of the major factors responsible for failure of root canal therapy is missed canals. Recent technological advances have given the clinician opportunity to identify anatomical variations and treat them to satisfaction.

Key words: Root canal aberrations, middle mesial canal, missed canals, anatomy of mandibular molar. (J Bagh Coll Dentistry 2016; 28(2):26-29).

INTRODUCTION

Root canal anatomy plays a significant role in endodontic success and failure [(1,2)], therefore; for initiation of endodontic procedure, we should be familiar with internal tooth anatomy [(3)]. If a canal is missed during endodontic treatment, then necrotic debris, pathogens and related irritants present in it can contribute to the formation of endodontic lesion, thus failure [(2,4)]. So, for the success of root canal therapy, a thorough knowledge of normal root canal anatomy and its possible variations of that particular tooth are vital.

When we consider different type of teeth, mandibular molar has complex anatomy [(5)].The presence of middle mesial (MM) canal in a mandibular molar was first reported by Vertucci and Williams [(6,7)]. Out of the types of middle mesial canals, the independent middle mesial canal is one which originates as a separate orifice and terminates at a separate foramen [(8)].

Out of hundred cases studied by Pomeranz et al. [(8)], only two cases were having independent canals. According to Goel et al. [(9)] out of total sixty mandibular first molars studied by them, only 6.7% of the middle mesial canals were independent.

Traditionally we use radiographic examination using conventional IOPA films for the evaluation of the root canal configuration. But due to its limitations; it is sometimes not able to identify the root canal system to satisfaction.

So to overcome these limitations, Cone Beam Computed Tomography (CBCT) imaging is a useful adjunct to study the root canal anatomy more precisely. It is better alternative to multidetector CT imaging in endodontics [(10)]. CBCT has a number of applications in endodontics as stated by Cotton et al [(11)]. Furthermore, Matherne et al. [(12)] suggested that CBCT imaging also helps in identifying the root canal system.

This case report presents management of mandibular first molar with an independent middle mesial canal by using CBCT imaging as an adjunct to identify the anatomy of middle mesial canal from orifice to apical foramen.

CASE REPORT

A 55 year-old female reported to Department of Conservative Dentistry and Endodontics, Genesis Institute of Dental Sciences and Research, Ferozepur, India with pain in the posterior right mandibular region for the last two weeks. She gave a history of intermittent, moderate intensity and non radiating type of pain. She gave dental history of sensitivity to hot and cold in that region for the past few months. Her past medical history was non significant.

On clinical examination, a carious lesion was found on right mandibular first molar. Tooth was tender on percussion. So, a diagnosis of chronic irreversible pulpitis with apical periodontitis was reached, thus requiring root canal treatment (Figure1). On thorough radiographic examination, there was slight indication of abnormal canal

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configuration as compared to usual two canals in the mesial root.

Figure 1: Preoperative radiograph of right mandibular first molar

To study the exact anatomy configuration of expected extra canal in mesial root, decision was taken to get CBCT imaging done. Consent was taken from the patient. CBCT of the mandible with the focus on the right mandibular first molar was performed. Axial, coronal, and sagittal CBCT slices revealed four canals (one in the distal root and three in the mesial root) in the referred tooth (Figure 2a,2b).

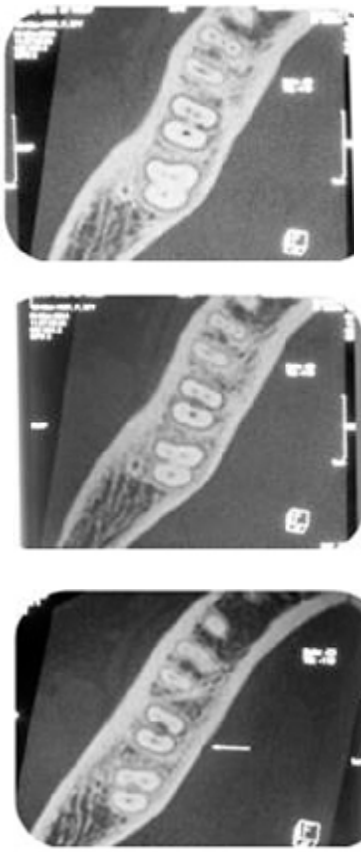

Figure 2: a. Coronal CBCT slice of right mandibular first molar at various levels

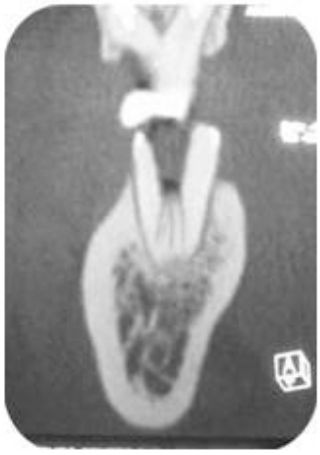

Figure 2: b. Sagittal CBCT slice of right mandibular first molar

Tooth was anesthetized using 2% lignocaine with 1:80,000 adrenaline. Under rubber dam isolation access cavity was prepared. The pulp floor showed three orifices corresponding to normally present three root canals: mesiobuccal, mesiolingual (ML), distal (D). But on careful inspection of the pulp chamber floor with magnification using operating microscope and DG16 probe revealed third canal opening in the mesial root (Figure 3). Apex locator (Root ZX, Morita, Tokyo, Japan) was used to measure working length, then a confirmatory IOPA radiograph was taken (Figure 4).

Figure 3: View of pulp chamber under operating microscope

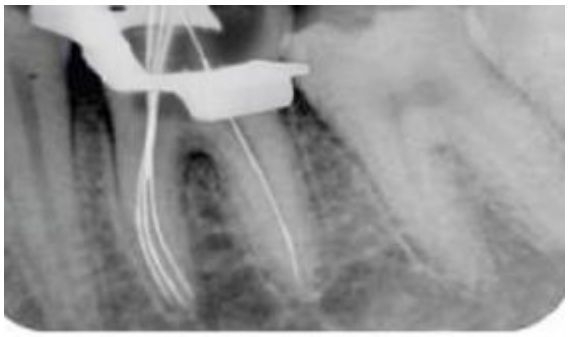

Figure 4: Working length radiograph.

After confirmation of four canals, pulpectomy was performed. Root canal preparation was performed with ProTaper rotary instruments (Dentsply Maillefer, Ballaigues, Switzerland) using step-down technique. 3% sodium hypochlorite (Prevest DenPro Limited. Jammu, India) was used for irrigation during instrumentation, followed by 17% EDTA (Prevest DenPro Limited, Jammu, India). Normal fresh saline (Beryl Drugs Ltd, India) was used as final irrigant, then canals were dried with fresh sterile paper points (Diadent group international, Korea). Obturation was performed using gutta-percha (Dentsply, Petropolis, RJ, Brazil) and AH Plus sealer (Dentsply DeTrey GmbH, Konstanz, Germany) using cold lateral condensation technique (Figure 5). In the follow up visit after six months of the endodontic treatment, the patient was asymptomatic.

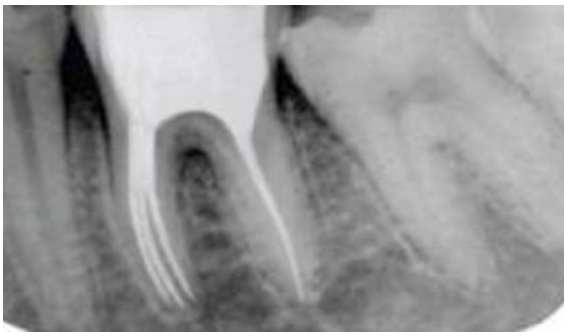

Figure 5: Post-obturation radiograph.

DISCUSSION

For the success of root canal treatment, a thorough knowledge of root canal morphology is vital [13]. When we are not able to locate the canal, it lefts untreated [14,15]. Presence of three canals in mesial root of mandibular first molar has been reported by many authors [16].

Fabra et al. [17] found in a study that out of total 760 samples, 20 mandibular molars were having three canals in the mesial root but only one tooth had independent middle mesial canal. As reported in various case reports and in vitro studies, incidence of middle mesial root canal in mandibular molars is 1-15% [18].

Careful clinical and radiographic inspection is backbone of endodontic success. Important diagnostic aids in locating root canal orifices are taking multiple angled radiographs, using sharp explorer to examine the pulp chamber floor , use of magnification, observing canal bleeding points, using ultrasonic tips for troughing, staining the chamber floor with 1% methylene blue dye and using sodium hypochlorite “champagne bubble test” [19].

Careful observation of angled radiographs is an important adjunct in identifying the variations in anatomy of mesial root of mandibular first molar. Instead of single straight view, buccolingual views i.e. 20° from mesial and 20° from distal reveal much better information of the root canal system. But a 2D image of 3D object is a significant limitation of conventional radiography. But interpretation based of 2D radiograph may alert the clinician about any aberrant root canal anatomy of tooth but would not be able to present the exact anatomy and its interrelations [20]. So, advanced diagnostic aids should be used to study morphology more precisely [19]. Tuned aperture computerized tomography imaging enhances canal detection as compared to conventional radiography as stated by Nance et al. [21]. Gopikrishna et al. also used spiral computerized tomography to study morphological aberration in the maxillary first molar [20].

CBCT machine used in this report is specifically made to display small parts of the jawbone with an image field size similar to that of ordinary dental films. Advantage of this machine is that it has considerably low effective dose than conventional CBCT machines. When only a small volume is examined dose is equivalent to two to three periapical radiographs [21]. Thus by using this imaging, we are able to study the root canal configuration and treat it adequately which is vital for long term success of root canal therapy.

As conclusion; treating tooth with abnormal root canal morphology is a tough task. Inadequate preparation of root canal system can lead to failure. With the advent of CBCT, we can better understand root canal anatomy, which in turn enables the clinician to do root canal procedures in a better way with predictable results

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