Case Report

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Endodontic Management of Radix Entomolaris along with Type II Mesial Canal Configuration of Mandibular First Molar Using CBCT

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Abstract

Anatomical Variation in the number of roots or root canals poses challenges in the endodontic treatment. Mandibular first molars presents various anatomical variation which have been studied and reported namely radix entomolaris, paramolaris, C shaped canals, mid mesial/ distal canal, taurodontism etc. Thorough knowledge of anatomy of apical canal merging in Type II canal configuration and Radix entomolaris is of importance with respect to the shaping of the canal and conserving the tooth structure. Also, there is a high risk of Instrument separation with NiTi rotary instrument when there is apical confluences and acute angle of root curvatures. Radix entomolaris in mandibular molars and Type II canal configuration have been widely reported in the literature involving other teeth but management of Type II mesial canal configuration has not been reported in mandibular molars. This case report describes the successful nonsurgical endodontic management of radix entomolaris along with Type II canal morphology with separated instrument in the mesial root of mandibular first molar using CBCT.

Keywords: Radix Entomolaris; Type II Canal Configuration; Separated Instrument; Mandibular First Molar.

Introduction

The mandibular first molar normally has two roots mesial and distal. The mesial root contains two canals and the distal root has one canal. An additional third root, an anatomical variant in mandibular molars, has been first described in literature by Carabelli and is known as Radix Entomolaris (RE). This supernumerary root is located distolingually to the mesial root [1].

The prevalence of RE has shown to vary specifically with races and ranges from 0-33.1%. The reported studies have noted that the prevalence of RE being highest among the population of Mongolian origin such as Chinese, Taiwanese, and Koreans having an eumorphic root morphology among them and was less frequent in African, Eurasian, Caucasian and Indian population having a dysmorphic root morphology in them [2,3].

The cause for the formation of RE is still unknown. The dysmorphic supernumerary roots may be associated with external factors during odontogenesis or due to an atavistic gene or polygenetic system. The third root may arise during the morpho-differentiation of tooth bud as a consequence of development defect of the ectoderm and mesoderm and its severity is related to the stage of formation the involved tooth [4].

Weine et al [5] were the first to describe the classification of more than one canal system in a single root. Vertucci [6] further classified the canal configuration which is widely accepted. According to Vertucci's classification, two separate orifices in the pulp chamber with two separate canals merge short of the apex to form one canal is Type II canal configuration. The prevalence of two canals in mesial root of mandibular first molar was 86% [7] to 94.4% [8] and the Type II canal configuration in mesial canals found in the previous studies were 14% [7] to 35% [8].

Endodontic Management of Type II canal configuration has been described in various case reports [9-14] of maxillary and mandibular teeth.

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However, none of the previous published case reports has described the endodontic management of Type II canal configuration of the mesial root of mandibular first molar along with radix entomolaris. This case report describes the successful endodontic management of Mandibular first Molar with radix entomolaris and Type II mesial canal configuration using CBCT.

Case Report

A 35 year old male patient reported to the Department of Conservative Dentistry & Endodontic, Maulana Azad Institute of Dental Sciences, with the chief complaint of severe pain in the lower right back region for last 7 days and experiencing discomfort during mastication. The medical history of the patient was non-contributory.

Clinical examination revealed carious lesion on the mandibular right first molar. The buccal and lingual mucosas were normal and there was no pain on palpation. No intra and extraoral swelling was evident. The tooth was very sensitive to percussion and giving no response to Electric Pulp tester.

Fig. 1: Preoperative / Diagnostic radiograph

The preoperative periapical radiograph revealed a radiolucent area close to the distal pulp horns in the crown, an unclear outline of the distal root contour and apical widening of the periodontal space (Fig 1).

A diagnosis of Pulpal necrosis with acute periapical periodontitis was made. Root canal treatment was initiated in mandibular right first molar.

Local anesthesia was administered, and access was prepared leading to two mesial and one distal canal orifices. As the first distal canal orifice was buccal, the access preparation was modified and extended on the lingual side to locate the other distal canal orifice, giving a trapezoidal shape. The root canals were explored with a precurved 15K-file (Dentsply Maillefer). The working length was determined electronically with an apex locator and confirmed by periapical radiography.

The root canals were shaped with Pro Taper rotary instruments (Dentsply Maillefer). During preparation, Glyde (Dentsply Maillefer) was used as the lubricant, and the root canals were disinfected with 2.5% NaOCl solution. The canals were prepared with an F2 instrument. During preparation, the F2 instrument was separated in the mesiobuccal canal at the point of

Fig. 2: Separated instrument in the MB canal.

merging (Fig 2). The canals were then dried and filled with $CaOH_2$ paste**.** The access was closed with a cotton pellet and temporary restoration. No attempt was made to retrieve the separated instrument at this visit.

After one week, the patient was asymptomatic. The $CaOH_2$ paste was removed by irrigation, and the retrieval of the separated instrument was attempted, but was not successful in retrieving. However the separated instrument was bypassed. The canals were

Fig. 3: Fit of master gutta percha cone.

irrigated, dried and a gutta-percha master cone was confirmed radiographically (Fig 3). The canals were obturated by lateral compaction with an AH26 Sealer and temporary restoration was given.

It was decided to evaluate the obturation three dimensionally using CBCT before final restoration and the patient consent was taken. The CBCT scan

Fig. 4: Final obturation and composite restoration

Fig. 5a: Filled MB canal and DB root

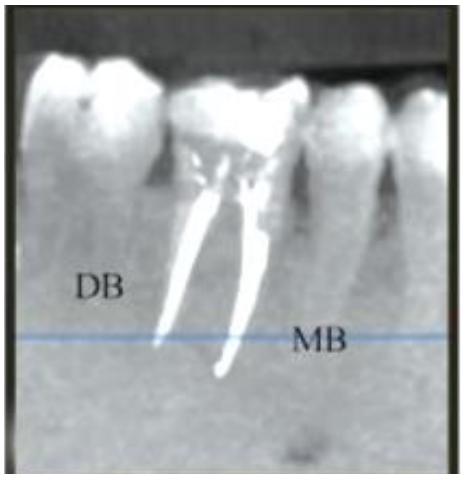


Fig. 5b: Filled ML canal and DL root

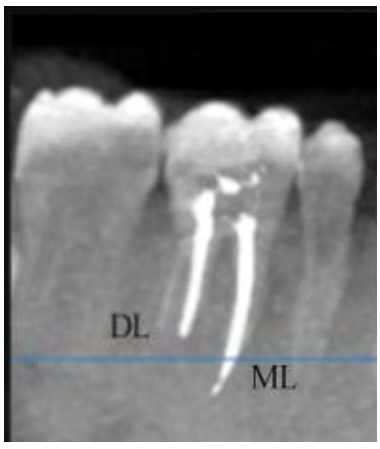


Fig. 5c: Filled M, DB & DL roots

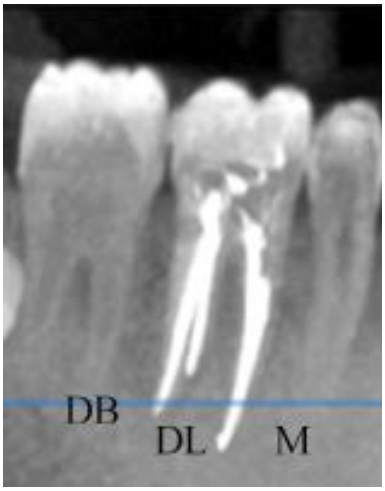


Fig. 6: Mesiodistal / Sagittal images of mesial root showing Type II canal configuration

Fig. 6a: Filled MB and ML canal short of point of confluence (POC)

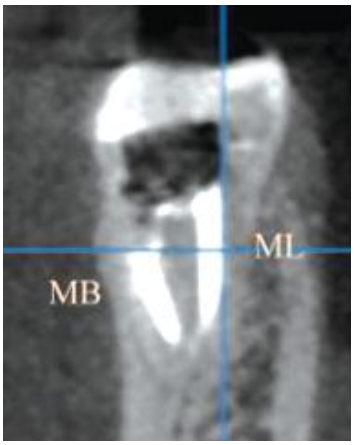


Fig. 6b: Apical merging of MB and ML canal at the point of confluence

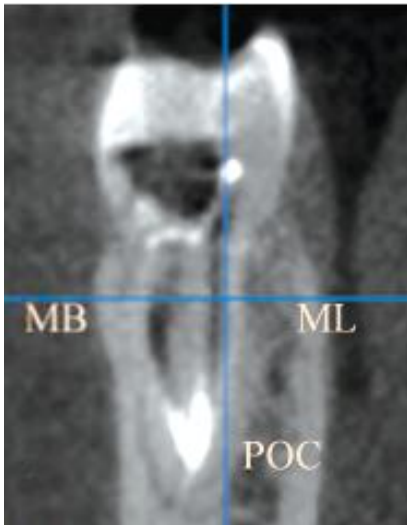


Fig. 6: Mesiodistal / Sagittal images of mesial root showing Type II canal configuration

Fig. 6c: Merged single mesial canal till the apical foramen in the mesial root

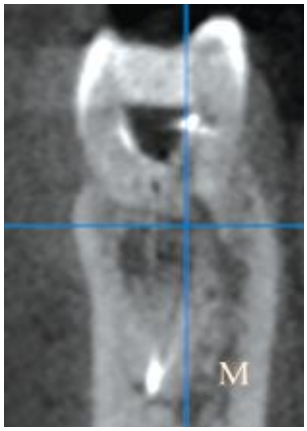


Fig. 7: Mesiodistal/Sagittal images of distal (DB and DL) roots

Fig. 7a: DB & DL roots

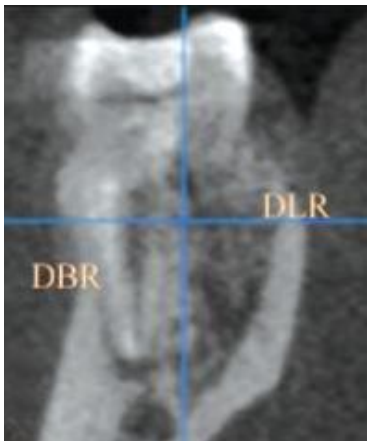


Fig. 7b: Filled DB root

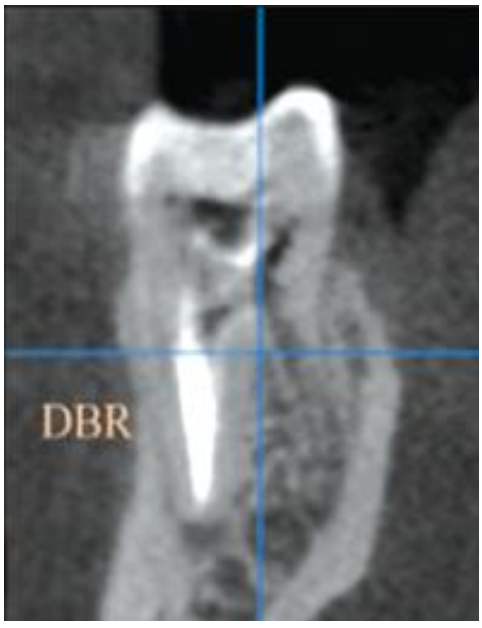


Fig. 7c: Filled DL root

Fig. 8: Axial section showing separate DB, DL canals and Type II canal configuration

Fig. 8a: Separate MB, ML, DB & DL canal (coronal third)

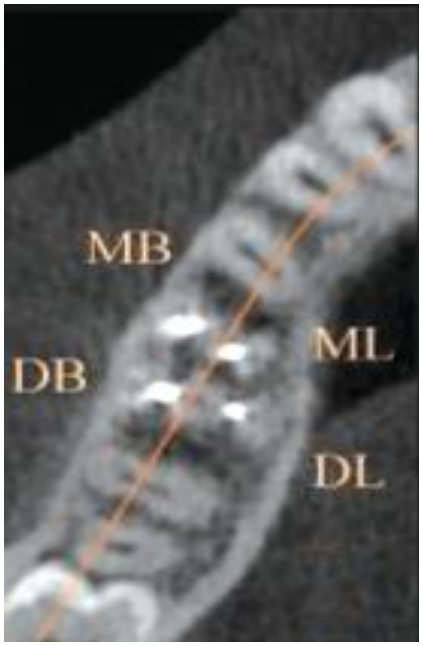


Fig. 8b: Separate MB, ML canal coming closer, separate DB& DL canal moving far from each other (middle third)

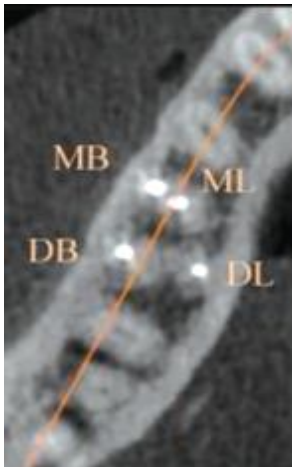


Fig. 8c: Merged mesial canal, separate DB canal (apical third) & DL canal at the apex

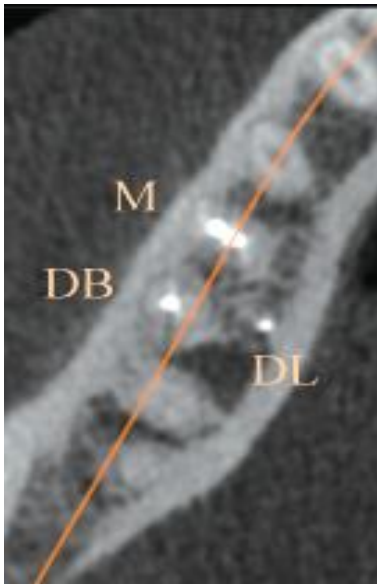
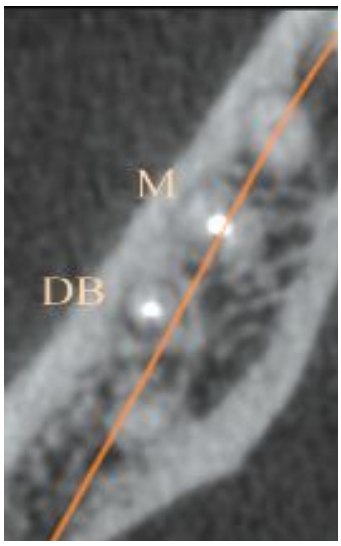


Fig. 8d: Merged single mesial canal and DB canal at the apex.



images were illustrated in Fig 5(a, b, c), Fig 6(a, b, c), Fig 7(a, b, c), Fig 8(a, b, c, d).

The access preparation was thereafter restored with composite resin (Fig 4).

Discussion

The success of an endodontic treatment depends on the skillful knowledge of the anatomical variants, correct diagnosis, thorough mechanical preparation, disinfection and sealing of the entire root canal system.

Missed extra root or root canal leads to failure of the endodontic procedure. The additional root can be identified by the clinical inspection of the tooth crown and the periodontal probing of the cervical morphology of the roots. The indication of an extra root may be the presence of an extra cusp in the crown or prominent disto occlusal or distolingual lobe along with a prominence or convexity of the cervical region [15]. However the present case showed the normal anatomy of the crown.

The diagnosis of Radix entomolaris can also be obtained by taking minimum of two angled diagnostic radiograph (Mesial or distal) [2].

The access preparation was modified to trapezoidal shape in the present report and straight line access was established for all canals. Parthasarathy et al [16] in their case report described that the extension of access preparation in RE should be done in accordance with the dentinal map and may requires modification from triangular to trapezoidal shape to include all orifices. Bolla [17] suggested that once the canal orifices are identified, obtaining straight line access to the canals is must.

The orifices were located by following the dentinal map and exploring with DG16 explorer and 10 K file. However, the identification of the canal orifices can be achieved with the thorough knowledge of law of symmetry and law of orifices, following the dentinal map and canal bleeding points, exploring of the grooves using DG16 explorer, K files, micro-opener or troughing with ultrasonic, staining the chamber with 1% methylene blue dye, champagne bubble test, magnetic resonance microscopy, CBCT, micro-computed Tomography [18].

Carlsen and Andersen [19] have classified RE based on the location of the cervical part. They are:

Type A and B refers to a distally located cervical part, Type C refers to a mesially located cervical part and Type A and C refers to the location of the cervical part in the central location in between the mesial and distal components.

De Moor et al [1] also classified based on the curvature RE variants in the buccolingual direction. They are:

Type I refers to straight root / canals, Type II refers to a curvature at the entrance of the orifice and Type III refers to RE with two curvatures, one at the coronal level and the other at the middle third.

The present case of RE is Type A and Type I as per above classifications.

The CBCT scan was used in this case report as it gives detailed examination of the entire root canal system and provides the information of thin slices of dental roots and canal systems. Also, the advanced dental soft-wares allows for 3D reconstructions of images across a multitude of planes [20].The superimposition of anatomic structures can be eliminated by analyzing the Saggital, coronal and axial CBCT images [21]. The number of root canals, their convergence or divergence from each other and visualization of root morphology in three dimension can also be achieved with CBCT scan [22].

Failure of endodontic treatment usually occurs in Type II canal configuration where two canals merge into a single canal short of the apex. Blockage of canal may occur as the pulp tissue or organic debris may be pushed from one canal into the adjoining canal. Manual Exploration of these canals should be done carefully with radiographs before the use of larger or rotary instruments to avoid procedural error. Coronal pulpal tissue removal with hand instruments should be done as much as possible prior to going down into the canal [23].

Schilder [24] suggested preparation of such canals should be done alternatively to prevent apical hourglass preparation which makes obturation difficult. According to Castellucci [25], cleaning and shaping of the mesiolingual canal should be started first as it has more rectilinear course. Also stripping of this canal is less frequent as it is more centered within the root. Once the preparation is finished, the working length of MB canal is measured by placing the small size instruement and introducing the gutta percha cone in the already prepared ML canal. The file and GP cone is removed from the MB & ML canal respectively. The GP was then examined for scratches, grooves or folds left by the file. Once the presence of the merging and its distance from the apical foramen is confirmed, the MB canal preparation should be started by measuring the length from the point of merging. During obturation, the main canal should first be obturated, thereafter the second canal was obturated to the point of merging.

The separated instrument in the MB canal in the present case report was bypassed and sealed. Cohen et al [26] suggested the three possible treatment options when treating separated instruement which includes Retrieval, Bypass and sealing the fragment within the root canal space and the True blockage.

The use of rotary instrument in Type II canal configuration requires meticulous precaution to avoid instrument fracture. While enlarging the apical portion of the joint canal, the instrument may get separated when trying to achieve full working length. This is because the instrument would be penetrating the joined part at a very acute angle or at a right angle, when it reaches the canal confluence [27].

Conclusion

This case report emphasizes on the importance of understanding the anatomical variation of the tooth. The Type II canal configuration, radix entomolaris are anatomic variation of mandibular molars. Thorough knowledge of the anatomy prior to the root canal treatment should be considered as an important clinical factor, setting a roadmap during the treatment thereby minimizing the risk of instrument separation and conserving the tooth structure in complex root canal anatomies leading to their subsequent success.

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