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ONE TOOTH TWO ROOTS THREE CANALS-THE COMPEX ROOT CANAL ARITHMETICS- A CASE REPORT

Dental Science

Dr. Babu P. P* *Corresponding Author

Dr. R. Vinay Chandra

Dr. Geeta I. B

Dr. Nanda Kishore

Dr. Thokala Dhamodaran

Dr. Sachin Sunny Otta

ABSTRACT

The proper knowledge of both the external and internal anatomy of teeth is mandatory for adequate root canal treatment. Permanent mandibular premolars are usually single rooted with single root canal. Variations of having more than one canal/root also exist.The Incidence of three canals in mandibular second premolar has been reported to be 0.46-0.5%. The present case describes root canal treatment of mandibular second premolar with two roots & three canals confirmed with CBCT evaluation. The clinicians must be aware of such anatomical variations and be able to use variety of tools for adequate diagnosis and management.

KEYWORDS

INTRODUCTION

Adequate root canal therapy requires locating, cleaning, shaping, and obturating all root canals. Therefore, failure of any of these principles can lead to post treatment disease, pain, and/or complications of treated tooth.[1,2]

Successful endodontic treatment requires an understanding of root canal anatomy and morphology. There is wide morphological divergence in the root canal system. Usually clinicians have a thorough understanding of normal anatomy and common variations. Clinicians should be able to identify teeth with different morphologies such as mandibular premolars.[3]

Several reports have shown that the incidence of one root canal system in mandibular premolars varied from 69.3% to 86% and two canals varied from 14% to 25.5%.[4,5,6]The occurrence of three canals has been reported by Vertucci and Zillich *et al*. to be 0.5% and 0.4%, respectively.[7,8]

A thorough knowledge of root canal anatomy, careful interpretation of radiographs and proper modification of the conventional access opening seem to be essential for recognition and adequate treatment of teeth with different anatomical variations.[9] The possibility of variations in root canal morphology must be considered before root canal treatment is undertaken.[10]

The present case report describes root canal treatment in a mandibular second premolar of a patient, which was referred to the department due to pain.

CASE REPORT

A 39 year old male patient reported to the Department of Conservative Dentistry & Endodontics due to pain on mandibular right second premolar. The patient gave a history of previous root canal treatment initiated 10 days ago. On examining the tooth clinically, it was found that root canal was initiated by a previous dentist & a temporary restoration was placed with a cotton pellet inside the pulp chamber.

Radiographically, there was radiolucency from the mesial aspect suggestive of marginal breakdown with radiolucency extending to the enamel, dentin & pulp with apparently normal radicular structure but widening of periodontal ligament space. The pulp canal space was noted to be a variation from the normal mandibular second molar anatomy. It was found have a bifurcated root from the cervical third with faintly radiopaque root canal space. A CBCT evaluation was advised for the area of interest.

CBCT report revealed that there are two roots-mesial and distal which are placed close to each other. There were three root canals- mesial, disto buccal and disto lingual. At the level of cervical third- there is single wide root canal, & moving inferiorly there is round mesial root canal, disto buccal and wide disto lingual canal can be appreciated. At the level of apical third, canals are thin but patent apically, mesial canal could not be traced out suggestive of partial calcification of the canal. Disto buccal and disto lingual canals are thin but patent. To our surprise, CBCT report of tooth #44 revealed two roots with two root canal morphology.(Fig 1 & Fig 2)

The tooth was isolated with rubber dam after administration of Inferior alveolar nerve block. The access cavity was re-entered using Endo access bur. The existing cotton pellet was removed & access cavity was re-defined using Endo Z bur (Dentsply). The exudate was dark brownish in colour suggestive of necrosed pulpal tissue. On refining the access cavity & irrigating the canal, it was found that the tooth had wide canal orifice. Two 10K files(Mani) were placed in the canal- one buccal & one lingual and an IOPAR investigation was made. Radiographic evaluation revealed that the files were in the buccal & lingual canals but there was still a patent canal mesially. Based on the CBCT reports, one more 10K file was placed & a mesially angulated radiograph was taken. The files were inserted till the working length as measured using apex locator. Radiographic evaluation revealed that the three files were in three different canals namely; mesial, distobuccal & distolingual & working length was also confirmed. The working length was 21mm as determined using apex locator & confirmed with radiograph.(Fig 3)

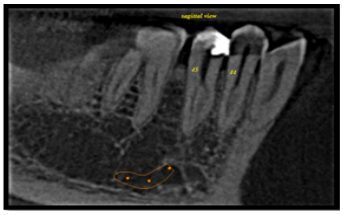

Fig 1.Sagittal view of tooth # 45 showing wide root canal at the cervical third & then dividing into three canals.

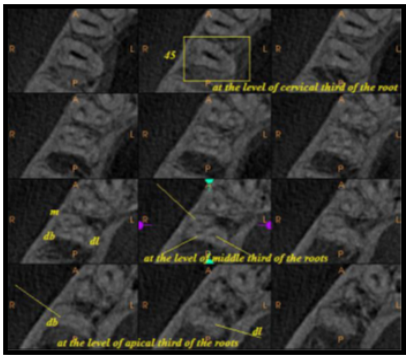

Fig 2.Axial view of tooth # 45 patency of three canals at Cervical (A), Middle(B) & Apical(C) third of canal.

The root canal was irrigated with 5.25% NaOCl & instrumentation was initiated with EDTA coated 10K file till the working length. The mesial canal was partly calcified with slight deviation to the distal aspect from the mid root region.

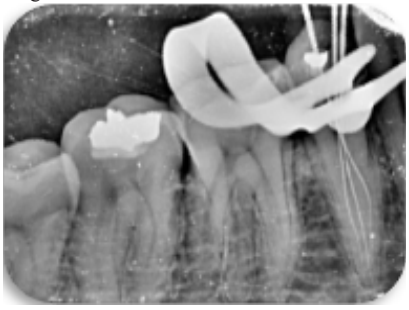

Fig 3.Determination of working length. 21mm for Mesial, Distobuccal & Distolingual canals

The instrumentation was initiated using 10K,15K & 20K hand files till the working length for all the three canals. The instrumentation was completed using 25/0.4 Healix Conmem M3 Gold file system (CM NiTi files). The instrumentation was done sequentially with rotary files coated with EDTA & copious irrigation with saline. Recapitulation was done with 20K file between each rotary file with 0.5ml of 5.25% NaOCl.

The root canals were obturated with Endoflas root canal sealer and a gutta-percha master cone size 25/0.4 (Fig 4,5). The access cavity was restored posterior composite restoration & was recalled after 1 week for review. After 1 week the patient reported complete alleviation of pain or other symptoms & and the patient was referred to Prosthodontic department for the final restoration.

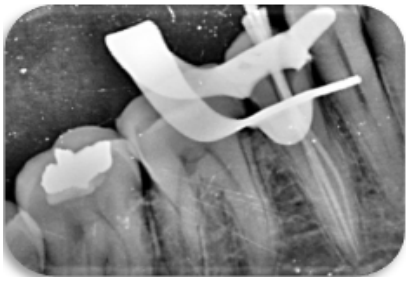

Fig 4.Master cone #25/4 placed in the canal

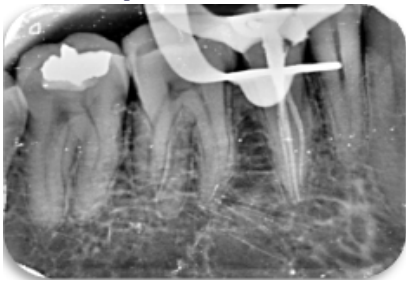

Fig 5.Obturation done using Endoflas sealer

DISCUSSION

Mandibular second premolar is one of the most difficult teeth for the endodontic treatment [11] because of the variations in internal morphology, extra root canals, apical deltas and lateral canals [12,13].

The present case reported mandibular second premolar with two roots & three root canals. This type of morphology is similar to the reported case in Jamaica by Nallapati *et al*.[13] On the other hand, two Indian cases of mandibular first premolars with two roots and three root canals were reported.[14,15] In addition, three roots and three root canals were also reported in United States of America, China, United Kingdom, and India.[16-19]

Proper interpretation of conventional periapical radiographs taken in more than one angle is mandatory to detect any morphological variations of teeth.[20,21] In addition, using advanced diagnostic radiographic techniques such as CBCT is very helpful to detect such variations if conventional radiographic techniques lack to provide obvious information and more details are required.[22-25]

CBCT was taken in this case which aid in the detection of morphological variations.

A dentin protuberance of mesiobuccal wall was obstructing the canal orifice, on removal of the same the wide canal was viewed & three files were introduced based upon the evidences from the CBCT report. If a working length file appears off centre on radiograph, the possibility of a second canal exist.[26]

The mesial canal had a distal angulation from the cervical third of the root.

As previous investigations[27] have pointed out that present-day apex locators ascertain reliable root canal length determination, radiographic working length determination during endodontic treatment is limited to those cases where reasonable doubt exists or when a radiograph is needed to verify file position.

The present root canal treatment was done as two visit procedure. First visit Re-access opening & pulp extripatation ,working length determination. Second vist chemo mechanical preparation & obturation with access filling). The root canals were prepared using Controlled memory Rotary NiTi files (Healix Conmem M3 Gold). Since the canals were almost patent except for the mesial canals, chemo mechanical preparation was completed using 25/4 & single cone obturation was done using Endoflas sealer.

Although *in vitro* and *in vivo* studies [28,9,18] report low incidence of mandibular second premolars with three canals, each case should be analysed individually through precise radiograph with different angulations and if required advanced imaging like CBCT should act as an adjuvant for successful management of complex root canal anatomy.

CONCLUSION

Root canal treatment was carried out successfully and the two month follow-up confirmed adequate healing without any complications.

It is strongly important to use all the available diagnostic tools to find and treat the full root canal system. Cautious interpretation of angled radiographs, good access preparation, proper inspection of pulpal floor, and a detailed examination of the internal anatomy of the tooth under magnification and with the aid of CBCT are important prerequisites for a successful treatment outcome.[29]

The present case report discussed about the proper diagnosis & identification of morphological variation using advanced diagnostic technique like CBCT with successful root canal treatment.

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