

Endodontic management of mandibular second premolar with aberrant root canal morphology using CBCT as a diagnostic tool – A case report.

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Abstract

Mandibular premolars have been designated as enigma to the endodontist because of its aberrant root and root canal configuration. Proper knowledge of canal anatomy is important to perform a successful endodontic therapy and to avoid or minimize procedural errors, with the use of CBCT, the diagnosis of such morphological variations is made easier. The present case report shows a successful endodontic management of a mandibular right second premolar with Gulabiwala Type III configuration (2-3) with an h shaped anatomy of root canal using CBCT for diagnosis.

Keywords: Mandibular second premolars, Gulabiwala Type III configuration, CBCT, neoprobe hand files, Pro Glider rotary files

Introduction

Successful endodontic therapy mandates knowledge of root canal anatomy, good-quality angulated radiographs, thorough disinfection of entire root canal system, and three-dimensional obturation of the canals.^[1] Root canals often shows aberrant anatomy and this factor is beyond the control of a clinician. Missed canals or inability to treat all the canals of the tooth is one of the major reasons of failure of the endodontic treatment. Other reasons of failure can be inability to disinfect the

root canals due to anatomical complexities and properly obturate the canals.

With the advent of newer diagnostic aids such as CBCT, it has become easier for the operator to identify the root canal anatomy of the teeth and avoid the risk of procedural errors.

Several reports have shown that the incidence of one root canal system in mandibular first premolar varied from 69.3% to 86% and two canals varied from 14% to 25.5%.^[2-5] The occurrence of three canals has been reported by Vertucci and Zillich et al. to be 0.5% and 0.4%, respectively.^[4,5] Vertucci et al. reported that the mandibular second premolar is having an incidence of one root canal at the apex in 97.5% and two canals in 2.5% of the teeth studied.^[6] While the incidence of three root canals reported to range from 0% to 0.4%.^[4,5]

There are various classifications of the root canal anatomy that have been put forward by many authors. In 1969, Weine et al. gave a classification, after studying the mesiobuccal root of a maxillary first molar as a reference. Pineda and Kuttler as well as Vertucci further developed a system for canal anatomy classification and designated them as Type I–VIII.^[1] Gulabivala et al. studied the root canal morphology of mandibular molars and identified seven additional canal configurations, according to the number of orifices, canals, and apical foramina.^[7]

The present case report is a successful endodontic management of mandibular second premolar with Gulabiwala's Type III (2–3) configuration using cone-beam computed tomography (CBCT) as a diagnostic tool.

Case Report

A 24-year-old male with a noncontributing medical history was reported to endodontic postgraduate clinics of Sri Guru Ram Das Institute of Dental Sciences and Research, Amritsar, Punjab, with a chief complaint of pain sensation in lower right back side of jaw on mastication.

Clinical examination revealed a carious tooth #45. The tooth was sensitive to percussion. There was no mobility and the periodontal status was normal. Radiographic examination revealed a carious lesion approaching pulp (Figure 1).



Figure 1: Pre-operative radiograph

Based on the clinical and radiographic findings, the tooth was diagnosed as Symptomatic irreversible pulpitis.

CBCT was carried out to confirm the numbers of roots and canals of the mandibular right first premolar. (Figure 2A, 2B) A single root with three canals was found, two buccal and one lingual. One buccal canal separated into 2 canals at the middle third (h shape). A nonsurgical root canal treatment was planned.

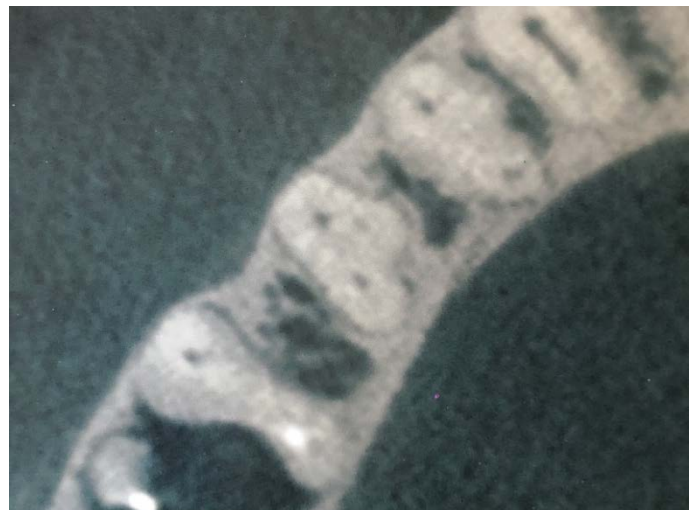


Figure 2A

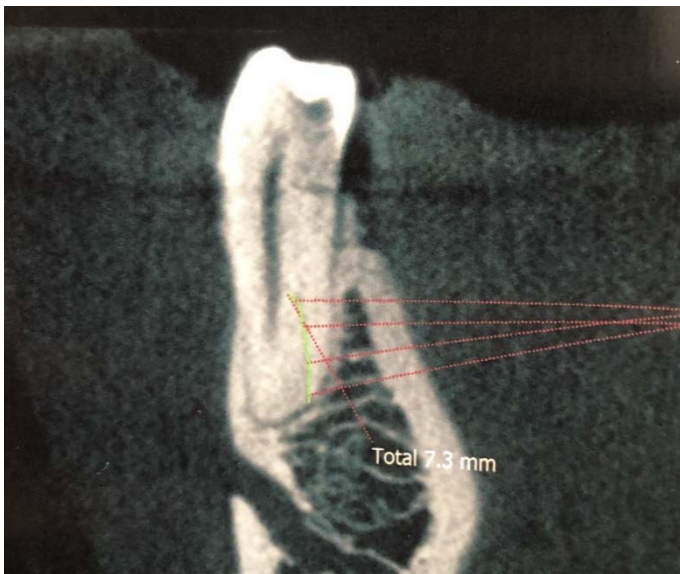


Figure 2B

Figure 2: CBCT sections showing second buccal canal. Local anesthesia (2% lidocaine and 1:100,000 epinephrine) was given to the patient and after isolation under rubber dam, the access cavity was made. (Figure 3).



Figure 3: Access opening

To obtain the access to second buccal canal, the buccal orifice was enlarged using ultrasonics. Patency was achieved with No. 10 K file. However, for the second buccal canal, neoprobe was used to achieve the patency. Glide path was established with ProGlider file (Dentsply). After all the canals were located, working length was established using 10K file using apex locator which was then confirmed by radiograph (Figure 4).

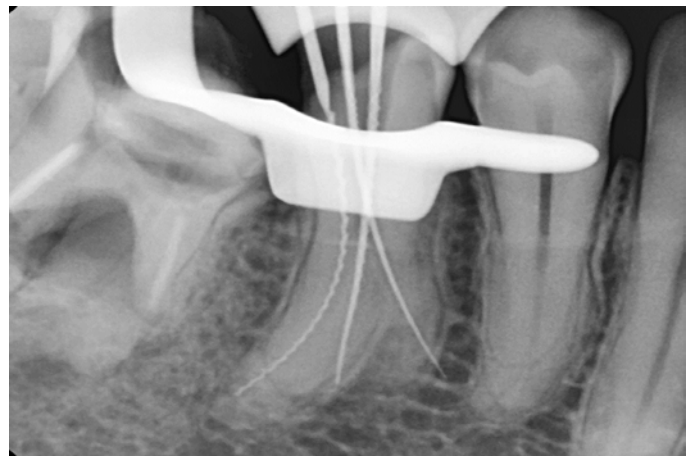


Figure 4: Working length radiograph

Subsequent shaping and cleaning was performed with neo endo rotary files till 25/.04. Copious irrigation was performed using 2.5% NaOCl and 17% EDTA. Action of NaOCl was augmented using ultrasonics. Saline was used to flush out debris from the canal and used in between the irrigants to avoid interaction between them. Chlorhexidine was used as a final rinse.

A confirmatory master cone radiograph was done before obturating the canals (Figure 5).



Figure 5: Master cone radiograph

All canals were dried with sterile paper points and then obturated using matching gutta-percha cones and Ceraseal bioceramic sealer. Post-operative composite restoration was done. Radiographs were taken at different angulations post-obturation. (Figure 6A, 6B, 6C)



Figure 6A



Figure 6B



Figure 6C

Figure 6: Post-obturation radiographs from different angulations

Discussion

Mandibular premolars with their root canal systems are considered the most difficult teeth to endodontically treat due to their wide variation of internal and external root

morphology and also that the division of the roots and/or root canals in these teeth usually occurs in the middle and apical thirds which makes detection of these anatomical variations difficult.^[8]

Mandibular second premolars usually have a single root with a single root canal. A systematic review on root anatomy and root canal configuration of mandibular premolars has observed that Caucasian, Indian, and Middle Eastern populations showed a higher prevalence of multiple canals (14%–17%).^[9]

Conventional periapical radiographs must be taken at more than one angulation to detect morphological variations of teeth. Gulabiwala et al. concluded from the observations in their study that broad, flat roots are much more likely to contain multiple canals and intercanal ramifications.^[7] When a canal suddenly disappears on a radiograph as proceeding apically, this situation is termed as fast break principle, and it usually happens when the main canal divides into two or more smaller canals.

In our case, there was one root and two canal orifices in relation to 45. However, 3 root canals exited at the apex (2-3 configuration). Buccal canal divided into two at middle third of the root. So the access cavity was modified and buccal orifice enlarged to gain access to second buccal canal.

Neoprobe hand files (12/.01) are usually used for curved and calcified canals. We used them for gaining entry to second buccal canal. We also used ProGlider rotary files (16/.02) to obtain a glide path till the apex. ProGlider has been used by other researchers as well for establishing a glide path for the endodontic treatment of the premolars.^[10,11]

Ultrasonics was used in our study as it has shown to potentiate the effect of NaOCl.^[12]

In addition, we used advanced diagnostic radiographic technique such as CBCT which helped in detecting the

variation in conjunct with the conventional radiographs to provide the required details regarding anatomy of the mandibular second premolar.

Instrument separation can happen at any stage of root canal treatment which includes endodontic files, GG burs, and spreaders. So care must be taken to modify the access cavity in order to provide a straight lines access upto the canal apex.

So it is evident that mandibular second premolars with three canals is a rare occurrence and should be managed strategically.

Conclusion

Detailed knowledge of the root canal system is mandatory for a successful endodontic treatment. A single canal in a tooth is not considered as a rule but rather an exception. We need to follow a series of basic principles for root canal therapy. Cautious interpretation of angled radiographs, good access preparation, careful inspection of pulpal floor, use of CBCT for efficient diagnosis are important prerequisites for a successful treatment outcome. Although the incidence of three root canals in the mandibular second premolars is relatively low, such teeth should be carefully diagnosed and strategically managed.

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