Print ISSN: 2321-6379
Online ISSN: 2321-595X
DOI: 10.17354/ijss/2016/359

Case Report

Management of Complex Root Canal Curvature of Bilateral Radix Entomolaris: Three-dimensional Analysis with Spiral Computed Tomography

Aditi Jain[1], Pragya Jaiswal[2], Yogesh Sahu[3], Abhinav Singhal[4], Vaibhav Sharma[5]

[1]Senior Lecturer, Department of Conservative Dentistry and Endodontics, Maitri Dental College and Research Center, Anjora, Durg, Chhattisgarh, India, [2]Assistant Professor, Department of Dental, Government Medical College, Rajnandgaon, Chhattisgarh, India, [3]Reader, Department of Conservative Dentistry and Endodontics, Maitri Dental College and Research Center, Anjora, Durg, Chhattisgarh, India, [4]Senior Lecturer, Department of Pedodontics, Maitri Dental College and Research Center, Anjora, Durg, Chhattisgarh, India, [5]Senior Lecturer, Department of Conservative Dentistry and Endodontics, Triveni Dental College, Bilaspur, Chhattisgarh, India

Abstract

A number of variations occur which pose a challenge to a clinician, so precise knowledge of anatomic characteristics is essential. An additional root in the permanent mandibular first molar is rare. The presence of an extra root on the lingual side of mandibular molar is known as radix entomolaris and on the buccal side is called as radix paramolaris. Endodontic treatment of these molars may be challenging compared with two-rooted molars owing to the unusual coronal and root canal morphology and need to modify the access cavity. There is not much data about the bilateral occurrence of such type of mandibular first molars. This case report describes two cases of mandibular first molar with three roots (one mesial and two distal) and four canals (two in mesial and one in each distobuccal and distolingual root) using spiral computed tomography (CT). The use of spiral CT serves as a boon in the diagnosis of complex anatomic variations.

Key words: Mandibular molar, Radix entomolaris, Spiral computed tomography

INTRODUCTION

Successful endodontic therapy depends on effective debridement and shaping of the root canal system.[1] Cleaning and shaping of root canal have been recognized as an important phase in endodontic therapy. The root canal morphology of teeth is often extremely complex and highly variable, so awareness and understanding can thus contribute to the successful outcome of the root canal treatment. Therefore, the primary step in root canal treatment is the identification of the internal morphology of canal system as precisely as possible so as to obtain predictable results.

Mandibular first molar can display several anatomical variations. The majority of cases have two roots and three canals. However, cases are reported with an extra third root which is placed distolingually in most of the cases.[2,3] The additional third root in permanent mandibular first molar variants has 3rd roots that are typically distributed distolingually. This additional root was first described in the literature by Carabelli[4] and is called the radix entomolaris (RE).[5] The frequency of RE is <5% in Caucasian, African, Eurasian, and Indian populations,[5] whereas its bilateral occurrence is <2.19%.[5] This additional root is typically smaller than the distobuccal root and is usually curved, requiring proper attention during cleaning and shaping procedures.[6]

Spiral computed tomography (CT) is a non-invasive technique to determine the occurrence of distolingual root and advantages of CT is that it can render cross-sectional (cut plane) and three-dimensional images that are highly accurate, high resolution, fully quantifiable, provide repeatable results and avoids the potential of a radiographic or photographic transfer error. Spiral CT is capable of providing sub-millimeter resolution in images of high diagnostic quality, with short scanning times (10-70 s), radiation dose is 15 times lower than those of conventional

Access this article online

www.ijss-sn.com

Month of Submission : 04-2016
Month of Peer Review : 05-2016
Month of Acceptance : 05-2016
Month of Publishing : 06-2016

Corresponding Author: Dr. Aditi Jain, D-13 Kailash Nagar, Rajnandgaon, Chhattisgarh, India. Phone: +91-9425516882. E-mail: Aditijain300789@gmail.com

scans. Spiral CT shows the exact position of the distolingual root, and hence, it helps in determining the curvature and prevents the iatrogenic event that might occur in relation to canal curvatures such as instrument breakage, perforation, and ledge formation.

CASE REPORTS

Case 1

An 18-year-old male patient reported to the department with the chief complaint of swelling in lower left the back region for last 2 days as well as pain in a lower right back. The pain was aggravated on taking cold and hot food items and on mastication. The clinical examination revealed the decayed right and left mandibular first molars. His medical history was non-significant.

RVG of 36 1revealed deep carious lesion involving the pulp with periapical radiolucency at the root apices and presence of an additional root in 36. On close inspection of the radiograph of left mandibular molar, an impression of double periodontal ligament space on distal side leads to the suspicion of additional root entity with 46. Based on the clinical and radiographic examination, diagnosis of the acute apical abscess with 36 and symptomatic irreversible pulpitis with acute apical periodontitis of 46 was established.

After adequate anesthesia and isolation with the rubber dam, access cavity was prepared using endo access kit in the mandibular left first molar. The access design is slightly modified using ultrasonic tips for exploring additional distal canal orifice. CT imaging had shown the severe curvature from the middle third to the apical third in the distolingual root; therefore, the canals were negotiated with Pathfinder .02 rotary NiTi files till the working length, and they glide through the canal and pasts the curvature smoothly. Instrumentation is completed with 0.04 tapered number 35 NiTi rotary instruments in a crown down fashion till the working length. All the canals were irrigated with 2.5% sodium hypochlorite and 17% ethylenediaminetetraacetic acid. Calcium hydroxide was placed into the canals as the intracanal medicament. After one week, the tooth was asymptomatic, and final irrigation was done with passive ultrasonic irrigation for 1 min. Canals were dried using paper point and obturated by gutta-percha and AH Plus sealer. Later, the access cavity was sealed with composite.

After completion of 36, endodontic treatment of the mandibular right first molar is started. After checking the patency, cleaning and shaping using controlled memory NiTi instruments are done. The canals are irrigated with 2.5% NaOCl and normal saline. Calcium hydroxide was used as the intracanal medicament, and access opening was sealed with temporary cement. One week later, the tooth was asymptomatic, the canals are dried with the paper point, obturation is completed, and access cavity is sealed with composite (Figures 1-4).

Case 2

A 21-year-old male patient was referred to the Department of Endodontics, with pain in 46. Medical history was non contributory. Clinical, radiographic and pulp testing examination revealed that tooth was symptomatic and patient requires endodontic treatment. The preoperative radiograph revealed the presence of an additional root then CT scan

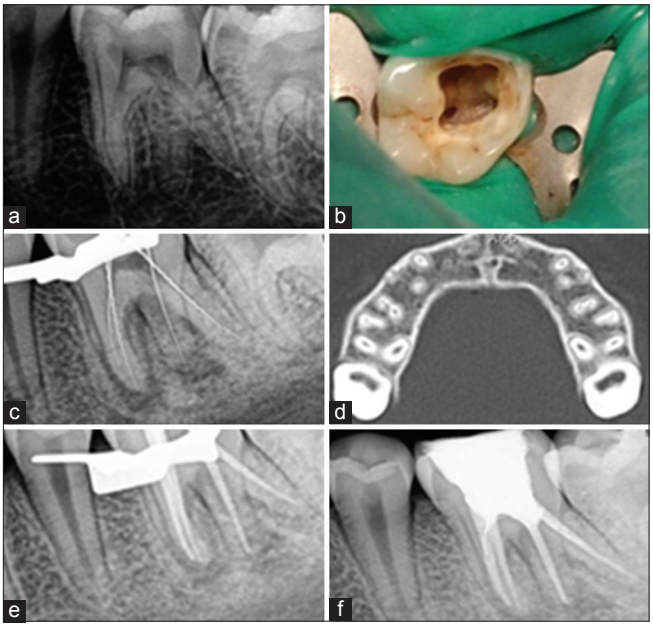

Figure 1: (a) Pre-operative, (b) access opening, (c) working length, (d) spiral computed tomography, (e) master cone, (f) obturation

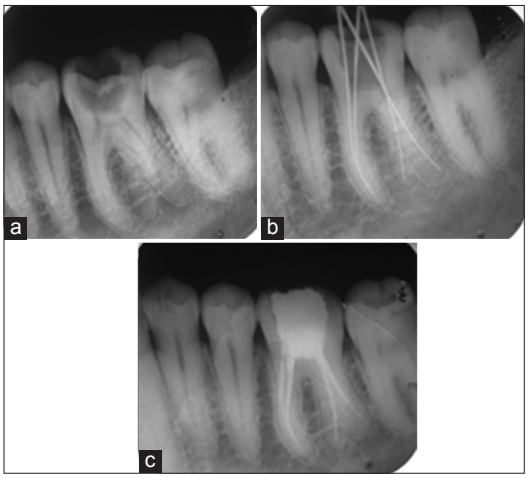

Figure 2: (a) Pre-operative, (b) working length, (c) obturation

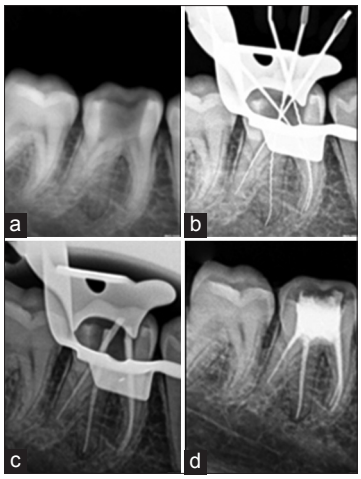

Figure 3: (a) Pre-operative intraoral periapical of 36, (b) working length, (c) master cone, (d) obturation

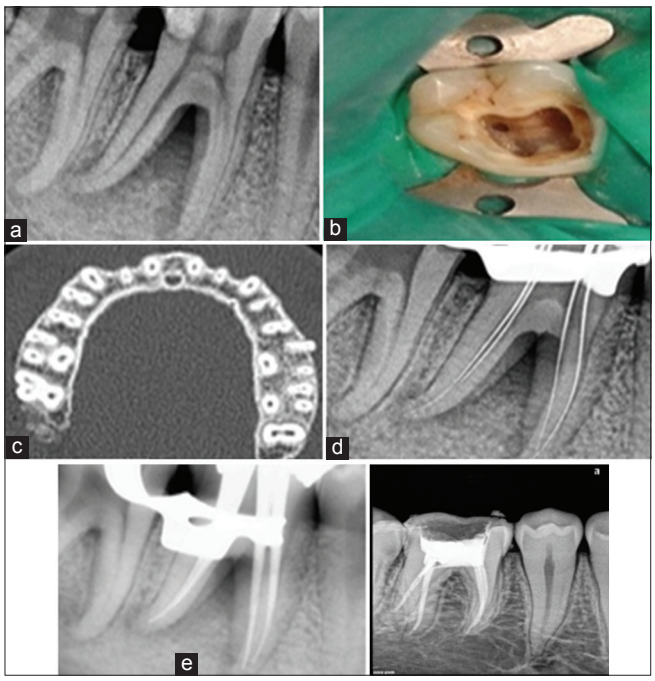

Figure 4: Pre-operative intraoral periapical of 46, (a) Pre-operative, (b) access opening, (c) spiral computed tomography, (d) working length, (e) master cone

was planned. After obtaining the informed consent from the patient, CT scan of the mandible was done and processed using Dentascan, Dental Software (GE healthcare, USA). CT imaging had shown the severe curvature from the middle third to the apical third in the distolingual root. Anesthetizing the tooth, a conventional endodontic access opening was made and then slightly modified by using ultrasonic tips for exploring additional distal canal orifice.

The working length of each canal was estimated by means of an apex locator (Root ZX: Morita, Tokyo, Japan), and confirmed with intra oral periapical radiograph. The canals were initially instrumented with #15 nickel titanium files (Dentsply Maillefer) under irrigation with 3% sodium hypochlorite and 17% EDTA. Coronal flaring was carried out by using Gates Glidden drills (number 3 and 2 Dentsply Maillefer). Cleaning and shaping were done using hand nickel titanium file system (Dentsply Maillefer). The canals were obturated with AH plus resin sealer and gutta-percha points using lateral condensation technique and tooth was restored with a posterior composite filling.

DISCUSSION

The success of endodontic therapy depends on the root canal morphology to some extent, so the clinician should have a thorough understanding of normal anatomy as well as its unusual anatomical configurations. The mandibular permanent first molars have several typical anatomical features and anomalies. The presence of four canals is relatively frequent,[6] but the presence of two distal roots is uncommon, and the bilateral presence of three-rooted mandibular molars is a rare case. This additional third root first mentioned in the literature by Carabelli (1844).[1] The coronal third of distolingual root of RE is fixed partially and completely to the distal root. Based on buccolingual orientation, De Moor *et al.*[7] have classified RE into three types. Type I refers to straight root or canal. Type II refers to an initially curved entrance which continues as a straight root/root canal. Type III refers to an initial curve in the coronal third of the root canal and a second curve beginning in the middle and continuing to the apical third. In this case, a distolingual root of 36 is classified as Type III because severe canal curvature is present in middle third till the apical end. The distolingual root of RE is mostly in the buccolingual plane as in conventional radiography (two-dimensional); tooth is visualized in the mesiodistal plane only. The scope of spiral CT is becoming broader day by day in ascertaining the exact location and anatomy of RE.

The position of distolingual canal orifice has an implication for access cavity preparation. The orifice of RE is located far distally; hence, the modification of the classical triangular access cavity to a trapezoidal form is required to identify the extra orifice and establish the straight-line access. The inner orifice distance between an extra distolingual canal and remaining canals can be measured with cone beam CT (CBCT), serving as a useful guideline to locate and treat RE.[5,8] The axial sectioning of CBCT allows for the exact visualization of a distolingual orifice in relation to about other canals. Ultrasonic tips help in careful removal of dentin and thus prevent weakening of tooth structure.[9]

The determination of root canal curvature is a main procedure for endodontic planning. Knowledge of root curvature radius allows for selection of NiTi rotary files and accurate planning of root canal instrumentation. NiTi

rotary files undergo hundreds of cycles of alternating compression and flexure when placed in a curved root. The radius of curvature is the most important factor influencing the cyclic fatigue. The more severe the angle of curvature with the small radius of curvature, the greater the cyclic fatigue and thus, lower its life expectancy.[10-12] Instrument separation increased as a radius of curvature decreased. Thus, file design should be taken into account while selecting the NiTi rotary instrument for curved canals.[13-15] In this case, flexible memory controlled NiTi files were used because they are highly resistant to cyclic fatigue and reduce the incidence of instrument breakage.

CONCLUSION

Spiral CT is a practical, non-invasive tool for morphological analysis. It also reduces the radiation dose to which patients are exposed. It helps in accurate diagnosis of the third root and can avoid complications or a "missed canal" during root canal treatment. Failing to realize curvature and radii of the canal before treatment can lead to procedural errors and which can compromise the outcome of the treatment. Additional aids that help in the location of orifices are following the law of symmetry, DG 16 probe, micro-opener, sodium hypochlorite "bubble" test, long shank burs, ultrasonic instruments, CBCT, and operating microscope.

REFERENCES

1. Barker BC, Parsons KC, Mills PR, Williams GL. Anatomy of root canals. III. Permanent mandibular molars. Aust Dent J 1974;19:408-13.
2. Vertucci FJ. Root canal anatomy of the human permanent teeth. Oral Surg Oral Med Oral Pathol 1984;58:589-99.
3. Vertucci FJ. Root canal morphology and its relationship to endodontic procedures. Endod Topics 2005;10:3-29.
4. Carabelli G. Systematisches Handbuch der Zahnheilkunde. 2nd ed. Vienna: Braumullerund Seidel; 1844. p. 114.
5. Al-Qudah AA, Awawdeh LA. Root and canal morphology of mandibular first and second molar teeth in a Jordanian population. Int Endod J. 2009 Sep;42(9):775-84.
6. Vertucci FJ, Haddix JE, Britto LR. Tooth morphology and access cavity preparation. In: Cohen S, Hargreaves KM, editors. Pathways of the Pulp. 9th ed. St. Louis: CV Mosby; 2006. p. 149-232.
7. Sperber GH, Moreau JL. Study of the number of roots and canals in Senegalese first permanent mandibular molars. Int Endod J 1998;31:117-22.
8. Tratman EK. Three rooted lower molars in man and their racial distribution. Br Dent J 1938;64:264-74.
9. Pedersen PO. The East Greenland Eskimo Dentition. Numerical Variations and Anatomy. A Contribution to Comparative Ethnic Odontography. Vol. 104. Copenhagen: Meddeleser om Gronland; 1949. p. 140-4.
10. Yew SC, Chan K. A retrospective study of endodontically treated mandibular first molars in a Chinese population. J Endod 1993;19:471-3.
11. Curzon ME. Three-rooted mandibular permanent molars in English Caucasians. J Dent Res 1973;52:181.
12. Ferraz JA, Pécora JD. Three-rooted mandibular molars in patients of Mongolian, Caucasian and Negro origin. Braz Dent J 1993;3:113-7.
13. Reichart PA, Metah D. Three-rooted permanent mandibular first molars in the Thai. Community Dent Oral Epidemiol 1981;9:191-2.
14. de Pablo OV, Estevez R, Peix Sanchez M, Heilborn C, Cohenca N. Root anatomy and canal configuration of the permanent mandibular first molar: a systematic review. J Endod. 2010 Dec;36(12):1919-31.
15. Steelman R. Incidence of an accessory distal root on mandibular first permanent molars in Hispaniv children. J Dent Child 1986;53:122-3.

How to cite this article: Jain A, Jaiswal P, Sahu Y, Singhal A, Sharma V. Management of Complex Root Canal Curvature of Bilateral Radix Entomolaris: Three-dimensional Analysis with Spiral Computed Tomography. Int J Sci Stud 2016;4(3):229-232.

Source of Support: Nil, **Conflict of Interest:** None declared.