Journal of International Oral Health 2015; 7(6):107-109

Received: 28th January 2015 Accepted: 20th April 2015 Conflicts of Interest: None

Source of Support: Nil

Case Report

Cone Beam Computed Tomography Assisted Endodontic Management of a Rare Case of Mandibular First Premolar with Three Roots

K Balakasireddy[1], K Pavan Kumar[2], Gijo John[3], C Gagan[4]

Contributors:
[1]Senior Lecturer, Department of Conservative Dentistry and Endodontics, MNR Dental College, Sangareddy, Telangana, India; [2]Professor, Department of Conservative Dentistry and Endodontics, MNR Dental College, Sangareddy, Telangana, India; [3]Post graduate, Department of Conservative Dentistry and Endodontics, MNR Dental College, Sangareddy, Telangana, India; [4]Associate Professor, Department of Conservative Dentistry and Endodontics, VRKS Womens Medical College, Hyderabad, Telangana, India.

Correspondence:
Dr. Balakasireddy K. Department of Conservative Dentistry and Endodontics, MNR Dental College, Sangareddy - 502 294, Telangana, India. Phone: +91-9908844488. Email:drbalakasireddy@gmail.com

How to cite the article:
Balakasireddy K, Kumar KP, John G, Gagan C. Cone beam computed tomography assisted endodontic management of a rare case of mandibular first premolar with three roots. J Int Oral Health 2015;7(6):107-109.

Abstract:
Understanding the morphological anatomy of the root and root canal systems of the teeth increases the success rate of endodontic therapy. Advanced diagnostic imaging techniques like cone beam computed tomography (CBCT) are an essential aid in understanding the anatomy of teeth especially in mandibular premolars. Most commonly mandibular first and second premolars have a single root and a single canal. However, multiple root and canals have also been reported. The present case report discusses endodontic management of a three rooted mandibular first premolar using CBCT.

Key Words: Cone beam computed tomography, endodontic management, mandibular first premolar, mandibular second premolar, three roots

Introduction

The success of root canal therapy is dependent on understanding the anatomy of root and root canal morphology.[1,2] Awareness and understanding of the presence of unusual external and internal root canal morphology largely contributes to the successful outcome of the root canal treatment.

In literature, description of the mandibular first premolar is typically of a single-rooted tooth.[3,4] Two-rooted, three-rooted, and four-rooted varieties have also been reported, but are rare.[5,6] The root frequently has developmental depressions or grooves on both the mesial and distal surfaces. According to Slowey, the mandibular premolars may present the greater difficulty of all teeth for a successful endodontic treatment.[7]

A study at the University of Washington in 1955 assessed the failure rate of non-surgical root canal therapy (NSRCT) in all teeth. The study reported highest failure rate mandibular first premolar at about 11.45%. Numerous endodontic failures after a routine treatment and flare-ups during the course of NSRCT are cited as evidence. It could be because of variations in root canal morphology and difficult access to additional canal systems.[8]

This case report presents a successful, non-surgical management of mandibular left second premolar with three roots and root canals and a first premolar with two roots using a cone beam computed tomography (CBCT).

Case Report

A 31-year-old male patient was reported to the Department of Conservative Dentistry and Endodontics, MNR Dental College and Hospital with a chief complaint of pain and pus discharge in the lower left back tooth region since 3 months. Patient reported no significant medical history. On clinical examination, there was a gingival inflammation with recession in relation to tooth numbers 34, 35, 36. The tooth was tender on palpation and tender on vertical percussion. Electric pulp testing and thermal testing of the teeth indicated non vitality of 34, 35, and 36. A confirmatory diagnosis of acute apical abscess in relation to 34, 35, and 36 was established and endodontic therapy was planned. An intraoral periapical radiograph shows bifurcated 34, 35 (Figure 1a). The mesiodistal width of the crown is lesser than mesiodistal diameter of the root and for further confirmation a CBCT (Gentex), was planned. CBCT with a 3D reconstruction confirmed a three rooted 34 and two rooted 35 (Figure 1b-d).

The area was anaesthetized using 2% lignocaine with 1:80,000 adrenaline (Lignox) and isolated with a rubber dam. An access cavity was prepared with a modification that it had a cut at the buccoproximal angle from the entrance of the buccal canals to the cavosurface angle, so that it is results in a T-shaped outline (Figure 2a). All the three canals are explored with a size 10 K-file. A working length was determined with an apex locator (Root - ZX) (Figure 2b). With Crown down technique, Cleaning and shaping were performed with twisted file and ProTaper rotary instruments (Dentsply Mailfilter). Abundant irrigation with 3% sodium hypochlorite solution is done. Biomechanical preparation is done up to F2. Before obturation irrigation with 17%, EDTA and saline are done. Obturation is

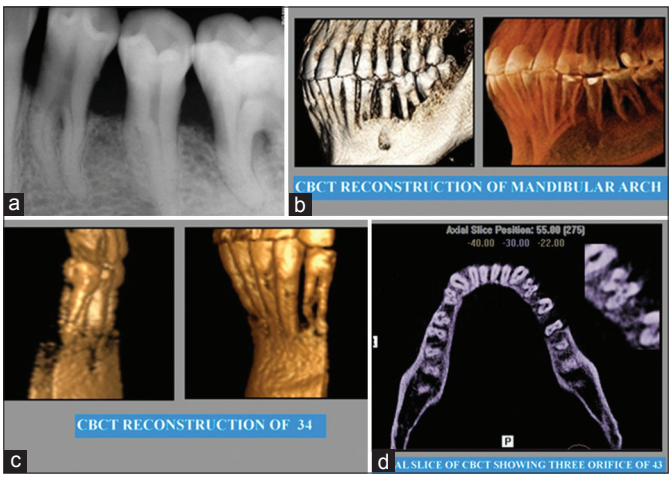

Figure 1: (a) Pre-operative radiograph showing first and second premolar and first molar. (b) Cone-beam computed tomography reconstruction of mandibular arch. (c) Cone-beam computed tomography reconstruction of 34. (d) Axial slice of cone-beam computed tomography.

done with gutta-percha and resin sealer (AH Plus, Dentsply) by cold lateral condensation (Figure 2c). The coronal access was restored with resin composite (3M ESPE) (Figure 2d).

Discussion

Successful and predictable endodontic treatment requires knowledge of biology, root canal anatomy, and careful radiographic evaluation in order to determine number of roots and root canals. Preoperative parallel radiographs, as well as mesial or distal angled radiographs, can help to determine number of roots. The diagnosis and management of extra roots or root canals in mandibular premolars pose an endodontic challenge. Failing to locate and obturating a root canal is the major cause of failure in endodontic therapy. Hoen and Pink found 42% incidence of missed roots or canals in the teeth that needed retreatment.[9] According to Cleghorn, the incidence of three rooted mandibular first premolars is 0.2%.[10] Hence, it is import that all the canals be located and treated during the course of nonsurgical endodontic therapy. Mandibular premolars have gained a reputation of having an aberrant anatomy.

Rodig and Hulsmann have reported a case of mandibular second premolar with three separate roots and root canals diagnosed using intraoral periapical radiographs.[2] Wong and Al-Fouzan have published cases of mandibular second premolars with four canals.[11,12] Tzanetakis *et al.* have reported endodontic management of mandibular second premolar with four root canals diagnosed with the aid of operating microscope.[13] It has been established that a root with a tapering canal and a single foramen is the exception rather than the rule. Serman and Hasselgren (1992) reported a high incidence of multiple roots (18.1%) and root canals in mandibular premolar teeth in a series of radiographic surveys with mandibular first premolars involved in 15.7% of patients and mandibular second premolars in 7% of patients.[14]

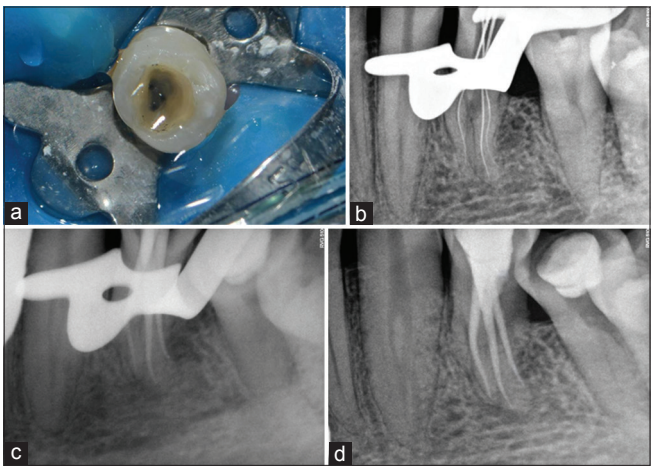

Figure 2: (a) Access opening showing 3 orifices. (b) Radiograph showing working length determination. (c) Postoperative radiograph. (d) Postoperative radiograph.

Studies by Lu *et al.* are similar to Slowey suggestions that mandibular premolars are the most difficult to treat endodontically and also the apical configuration of these teeth was found to be complex.[15]

Thus, a careful understanding and diagnosis of canal anatomy is of utmost importance for successful management of such cases. Accurate preoperative radiographs of good quality along with an occlusal view, into the access opening and down the chamber of a mandibular premolar tooth, rarely shows any chamber floor, even when a suspected bifurcation of the canal is seen on the radiograph. The surgical operating microscope sometimes aids in canal visualization of a canal system branching off the main canal. A fine, curved stainless steel file with a good Tactile sense is the best guide to the detection of the accessory canals.[16] A modification in the access cavity preparation is often needed for unhiding the additional orifices of the root canals or the orifices of the extra roots for a better instrumentation. When present the roots are usually – mesiobuccal, distobuccal, and a lingual root. At least two radiographs, with the second radiograph angulated from 15° to 20° either mesial or distal from the horizontal long axis of the root, are required to reliably diagnose more than one root or root canal system in premolar teeth.

A sudden narrowing of the main canal on a parallel radiograph was a good criterion to judge root canal multiplicity.[17] However, Martinez-Lozano *et al.* recommend up to 40° mesial angulation from horizontal as more reliable in identifying the extra canals.[18] Deviation of the X-ray angle from the vertical axis of 15° to 30° was effective only in the mandibular first premolar in helping to visualize canal anatomy of premolar teeth. Dyes, fiber-optic transillumination, magnifying loupes, and sodium hypochlorite bubbling in the extra canals help in locating additional canals.

With the advent of advanced imaging techniques, an understanding of complex anatomies is made easier. CBCT is

better of digital radiographic techniques in identifying multiple root canal systems in the mandibular incisor, mandibular first premolar, and maxillary first molar teeth.[19]

Conclusion

A good knowledge of root canal anatomy facilitates Successful endodontic treatment. Management of teeth with morphological variations presents a challenge, which requires proper instruments and the knowledge to use the instruments effectively. Advanced imaging techniques like CBCT are valuable tools in diagnosing and managing cases, which deviate from the regular pattern. The present case report emphasizes the need to understand, interpret, and manage a three rooted mandibular first premolar with three roots which has been successfully managed using CBCT.

References

1. Krasner P, Rankow HJ. Anatomy of pulp chamber floor. J Endod 2004;30(1):5-16.
2. Rödig T, Hülsmann M. Diagnosis and root canal treatment of a mandibular second premolar with three root canals. Int Endod J 2003;36(12):912-9.
3. Ash M, Nelson S. Wheeler's Dental Anatomy, Physiology and Occlusion, 8th ed. Philadelphia: W. B. Saunders; 2003.
4. Black G. Descriptive Anatomy of the Teeth, 4th ed. Philadelphia: SS White Dental Manufacturing Company; 1902.
5. Brown P, Herbranson E. Dental Anatomy & 3D Tooth Atlas, Version 3.0, 2nd ed. Carol Stream, IL: Quintessence; 2005.
6. Geider P, Perrin C, Fontaine M. Endodontic anatomy of lower premolars – Apropos of 669 cases. J Odontol Conserv 1989;11-5.
7. Slowey RR. Root canal anatomy. Road map to successful endodontics. Dent Clin North Am 1979;23(4):555-73.
8. Ingle J, Bakland L. Endodontics, 5th ed. Hamilton: BC Decker; 2002.
9. Hoen MM, Pink FE. Contemporary endodontic retreatments: An analysis based on clinical treatment findings. J Endod 2002;28(12):834-6.
10. Cleghorn BM, Christie WH, Dong CC. The root and root canal morphology of the human mandibular first premolar literature review. J Endod 2007;33(5):509-16.
11. Wong M. Four root canals in a mandibular 2nd premolar. J Endod 1991;17:125-6.
12. Al-Fouzan KS. The microscopic diagnosis and treatment of a mandibular second premolar with four canals. Int Endod J 2001;34(5):406-10.
13. Tzanetakis GN, Lagoudakos TA, Kontakiotis EG. Endodontic treatment of a mandibular second premolar with four canals using operating microscope. J Endod 2007;33(3):318-21.
14. Serman NJ, Hasselgren G. The radiographic incidence of multiple roots and canals in human mandibular premolars. Int Endod J 1992;25(5):234-7.
15. Lu TY, Yang SF, Pai SF. Complicated root canal morphology of mandibular first premolar in a Chinese population using the cross section method. J Endod 2006;32(10):932-6.
16. England MC Jr, Hartwell GR, Lance JR. Detection and treatment of multiple canals in mandibular premolars. J Endod 1991;17(4):174-8.
17. Yoshioka T, Villegas JC, Kobayashi C, Suda H. Radiographic evaluation of root canal multiplicity in mandibular first premolars. J Endod 2004;30(2):73-4.
18. Martínez-Lozano MA, Forner-Navarro L, Sánchez-Cortés JL. Analysis of radiologic factors in determining premolar root canal systems. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1999;88(6):719-22.
19. Matherne RP, Angelopoulos C, Kulild JC, Tira D. Use of cone-beam computed tomography to identify root canal systems *in vitro*. J Endod 2008;34(1):87-9.