Biomedical Research 2016; 27 (1): 177-180

ISSN 0970-938X
www.biomedres.info

Cone beam computarized tomography analysis of a unusual mandibular canine with two independent roots and two canals.

Betancourt P*, Fuentes R.

Research Centre in Dental Sciences (CICO), Dental School, Endodontic laboratory , Universidad de La Frontera, Temuco, Chile

Abstract

The anatomical variation of two independent roots and two canals in lower canines is infrequent, from 1.7% to 5%. Conventional periapical radiography continues to be the most widely-used diagnostic method in clinical endodontics, however the development of Cone Beam Computerized Tomography (CBCT) has shown up the deficiencies of conventional radiography.

The object of the present report is to describe endodontic treatment of an unusual mandibular canine with two independent roots and two canals using CBCT.

Keywords: Mandibular canine, Two roots, Cone beam computerized tomography.

Accepted December 05, 2015

Introduction

The internal anatomy of the root often does not reproduce the simplicity of the tooth's external anatomy, sometimes presenting multiple variations. Mandibular canines are an example of this, since they present a complex internal anatomy [1].

The anatomical variation of two independent roots (vestibular and lingual) each with an independent canal is infrequent and has been described in the literature through case reports [2, 3, 4]. Another factor which influences the success of endodontic treatment is the appropriate use of imaging techniques as part of diagnosis and treatment planning. Conventional periapical radiography continues to be the most widely-used diagnostic method in clinical endodontics, however the development of CBCT has shown up the deficiencies of conventional radiography for evaluating dental anatomy in three dimensions (3D) [5].

The object of the present report is to describe endodontic treatment of an unusual mandibular canine with two independent roots and two canals using CBCT.

Case Report

Male patient, aged 62 years, no relevant clinical history, was referred to the Endodontics Unit of Universidad de La Frontera, Temuco, Chile, for diagnostic and therapeutic evaluation of the left mandibular canine (tooth 33).

On clinical examination, profound mesial caries was observed, with grade 1 mobility and pain under percussion. The result of sensitivity tests was negative. Initial periapical radiography (Figure 1A), revealed penetrating mesio-cervical caries, widening of the periodontal ligament and the presence of two roots and two canals in the mandibular canine, which bifurcated in the middle third of the root. Percussion test was positive. The radiographic study was complemented by periapical radiography with mesial (Figure 1B) and distal distortion (Figure 1C). The endodontic diagnosis for tooth 33 was symptomatic apical periodontitis.

To obtain more information on the internal anatomy of the canal system, a CBCT examination of the tooth in question was requested (Pax Zenith, Vatech, Korea, 2011). The examination was done with a FOV 8×6 cm, Using 120 kV , 9 mA and voxel size of 0.12 mm. The image was analysed with Ez 3D 2009 software, using sections with interval 0.5 mm and thickness in the axial plane 1 mm, systematically from the floor of the pulp chamber to the apical region. The images were viewed using a LG LED screen, Model 42LE4300-SA.

Tooth 33 (Figure 2A) was observed to present a single, straight canal in the cervical third (Figure 2B), with widening in the vestibular-lingual direction. Between the cervical and the middle third the root bifurcates into two roots, one vestibular and the other lingual, each with a canal (Figure 2C). The vestibular canal presented a slight curvature to lingual in the middle third and to vestibular in the apical third, while the lingual canal turned to mesial in the middle third and to vestibular in the apical third (Figure 2D). Symptomatic apical periodontitis was diagnosed and the patient was referred for endodontic treatment.

The root canals were located and permeabilised with

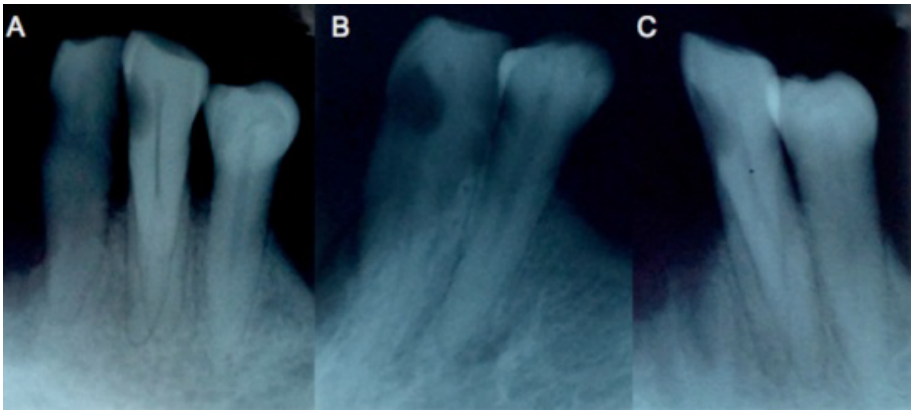

Figure 1. *Initial conventional periapical radiography, left mandibular canine with two roots and two root canals.* ***A****: ortho-radial direction;* ***B****: mesial distorsion;* ***C****: distal distorsion.*

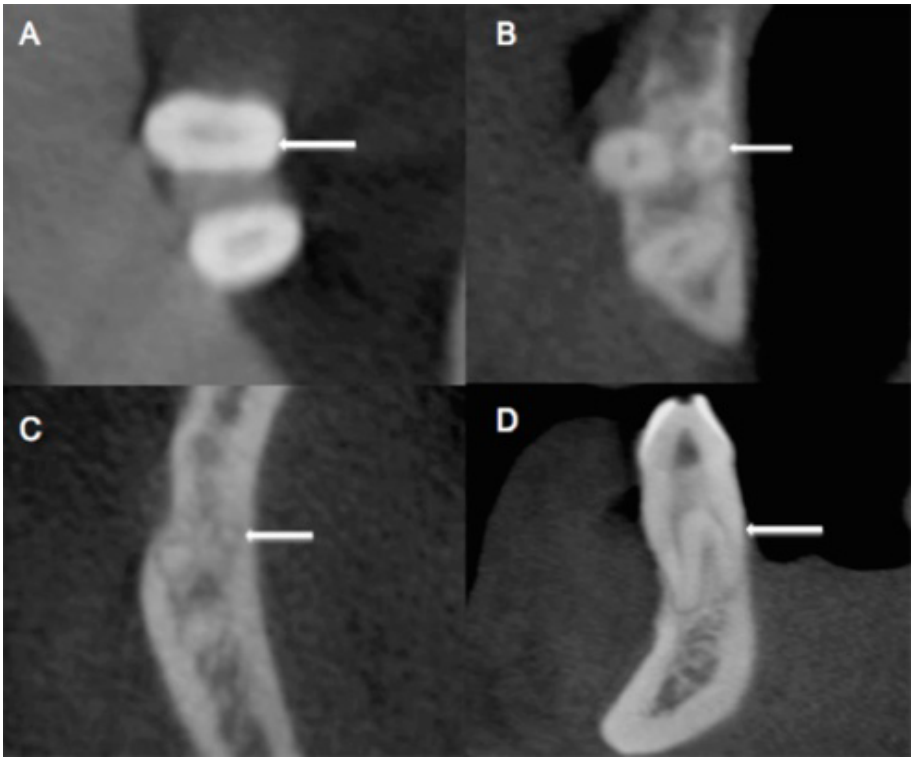

Figure 2. *Initial CBCT image of the left mandibular canine with 2 roots and 2 root canals using Ez 3D 2009 software. White arrow indicates the left lower mandibular canine in A and the lingual accessory root in B-C-D; A: axial section, cervical third; B: axial section, middle third;* ***C:*** *axial section, apical third;* ***D****: cross section.*

K files #10 and #15 (Dentsply / Maillefer, Ballaigues, Switzerland). The cervical and middle thirds of the canals were prepared with SX and S1 files of the ProTaper Universal® system (Dentsply/Maillefer, Ballaigues, Switzerland). The length of the root canal was determined by radiography and confirmed with an electronic apical locator (Propex Pixie®, Denstply /Maillefer, Ballaigues, Switzerland). Chemical-mechanical preparation was done with Flexofile manual files (Dentsply/Maillefer, Ballaigues, Switzerland) to obtain calibre #35 in both canals using the crown down instrumentation technique, irrigating with sodium hypochlorite 2.5% (Asfer Chemical Industry Ltd., Sao Caetano Industry Ltd, Sao Caetano do Sul, SP, Brazil) at each instrument change. The canals were lubricated with ethylenediaminetetraacetic acid (EDTA) 17% (Glyde®, Dentsply/Maillefer, Ballaigues, Switzerland) and then filled with calcium hydroxide paste Ultracal® XS (Ultradent, South Jordan, UT, USA). The patient was requested to return in 7 days. On the second visit, the tooth was asymptomatic. Final irrigation was carried out with sodium hypochlorite 2.5%, followed by normal saline solution. An epoxy resin-based endodontic cement was used (Top Seal®, Dentsply / Maillefer, Ballaigues, Switzerland) with the cold lateral compaction technique. The final x-rays showed both canals correctly filled. Finally, clinical and x-ray check-ups were done at 15 and 30 days, reporting absence of painful symptoms and normal periapical x-rays (Figure 3). A complementary CBCT examination was also requested, which showed in 3D that the canals were completely filled (Figure 4) and a better understandment of its external anatomy (Figure 5).

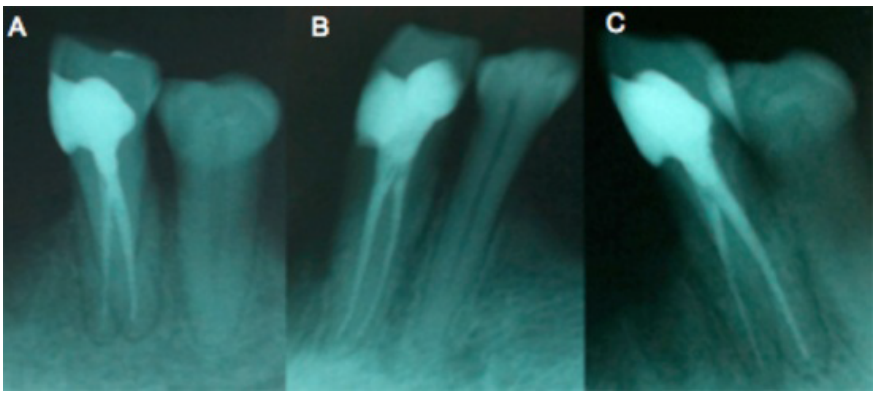

Figure 3. *Final conventional periapical radiography, left mandibular canine with two roots and two root canals.* ***A:*** *ortho-radial direction;* ***B****: mesial distorsion;* ***C:*** *distal distorsion.*

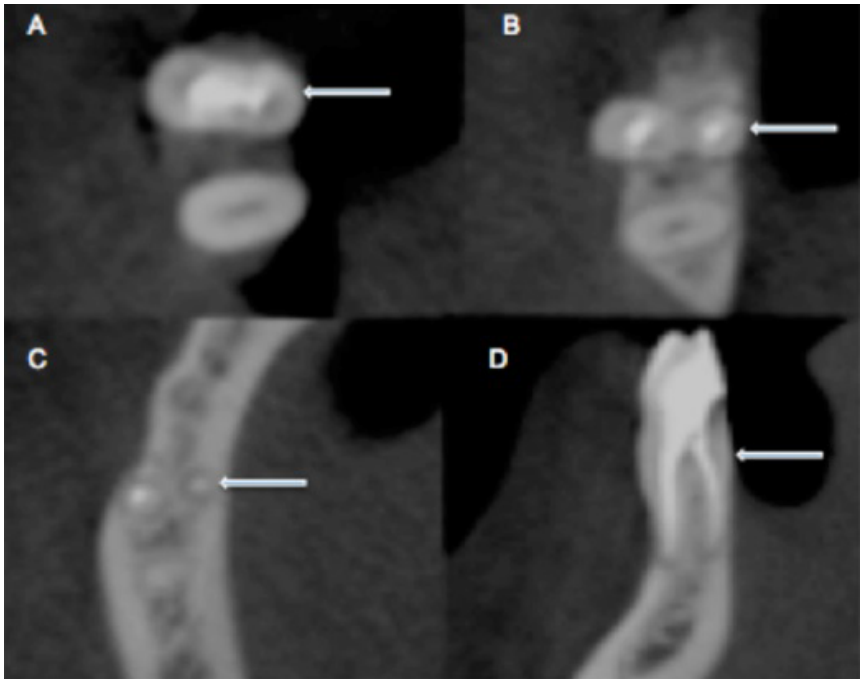

Figure 4. *Final CBCT image of the left mandibular canine with 2 roots and 2 root canals, with completed endodontic filling, using Ez 3D 2009 software. White arrow indicates the left lower mandibular canine in A and the lingual accessory root in B-C-D;* ***A:*** *axial section, cervical third;* ***B:*** *axial section, middle third;* ***C:*** *axial section, apical third;* ***D:*** *cross section.*

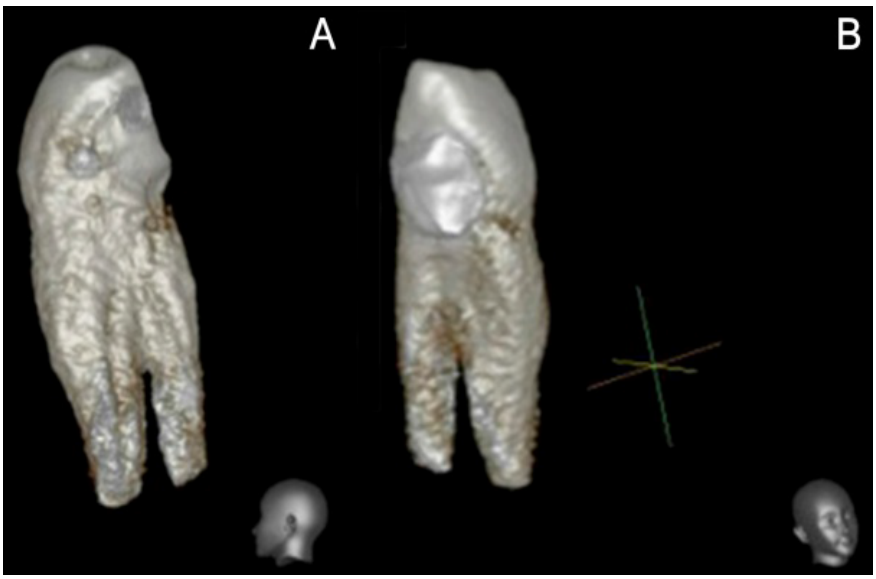

Figure 5. *Three-dimensional reconstruction of the birradicular left mandibular canine, without the presence of alveolar bone.* ***A****: left view;* ***B****: right view.*

Discussion

The mandibular canine usually presents one canal and one root [6]; however variations have been reported [2, 3, 4]. On the other hand the presence of two roots in lower canines is rarely observed. Ouellette [7] describes the occurrence of two roots and two canals in lower canines in only 5% of all teeth analysed. Laurichesse et al [8] describe a second root in mandibular canines in only 1% of cases. Pécora et al. [6], in a diaphanisation study of 830 extracted mandibular canines, observed only 1.7% of teeth with two roots and two separate canals.

Conventional periapical radiography continues to be the most widely-used diagnostic method for distinguishing the internal anatomy of the tooth; however periapical radiography frequently fails to detect a second root with its canal [9], due to the superposition of structures such as other roots of the same tooth, the zygomatic arch or excessive bone density. Pécora et al. [6] described root direction in the mandibular canine and found that 48.7% of roots present curvature, 1.0% to lingual and 3.2% to vestibular. Because curvatures increase the length of work in endodontic treatment, they need to be detected and measured to avoid inadequate instrumentation or incomplete filling. In the case presented in this report it was observed in CBCT that both canals presented curvatures in the vestibular-lingual direction, which could not be detected in the periapical radiography, due to the two-dimensional nature of the image. CBCT also made it possible to detect the curvatures present in a vestibular-lingual direction, to identify the exact point of root and canal bifurcation and to measure exactly the crown-root length. Conventional radiography images must be examined carefully in order to interpret and identify details which may suggest the presence of bifurcations or trifurcations of the root canal or the presence of an accessory root.

Conclusion

Although the most common anatomy of mandibular canines comprises a single root and a single root canal, the clinician must take into account possible anatomical variations such as the direction of curvatures, and always look for a second root canal, whether associated with one or two roots. CBCT is a convenient method for complementary diagnosis before establishing a course of endodontic treatment.

References

1. Oana Cella A, Ruxandra M, Luminita D. Rom J Morphol Embryo 2010; 51: 565-568.
2. D' Arcangelo C, Varvara G, De Fazio P. Root canal treatment in mandibular canines with two roots: a report of two cases. Int Endod J 2001; 34: 331-334.
3. 3.Victorino FR, Bernardes RA, Baldi JV. Bilateral mandibular canines with two roots and two separate canals: case report. Braz Dent J 2009; 20: 84-86.
4. Fuentes R, Borie E. Bilateral two-rooted mandibular canines in the same individual: a case report. Int J Odontostomat 2013; 7: 471-473.
5. Durack C , Patel S. Cone beam computed tomography in endodontics. Braz Dent J 2012; 23: 179-191.
6. Pécora JD, Sousa Neto MD, Saquy PC. Internal anatomy, direction and number of roots and size of human mandibular canines. Braz Dent J 1993; 4: 53-57.
7. Ouellet R. Mandibular permanent cuspids with two roots. J Can Dent Assoc 1995; 61: 159-161.
8. Laurichesse JM, Maestroni J, Breillat J. Endodontie Clinique. 1st ed Paris, France 1986; pp 64-66.
9. Zheng Q, Wang Y, Zhou X, Wang Q, Zheng G, Huang D. A Cone-Beam Computed Tomography Study of Maxillary First Permanent Molar Root and Canal Morphology in a Chinese Population. J Endod 2010; 36: 1480-1484.

Correspondence to:

Pablo Betancourt
Integral Adultos department
Odontology Faculty
Universidad de La Frontera
Temuco
Chile