Endodontic Management of Radix Entomolaris diagnosed with Cone Beam Computerized Tomography: Two Case Reports

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Abstract

The importance of knowledge of the variation in internal anatomy of root canals is essential for the success of endodontic treatment. Mandibular molars can have an additional root located lingually (the Radix entomolaris). If present, an awareness and understanding of this unusual root and its root canal morphology can contribute to the successful outcome of root canal treatment. In this report, the authors describe the endodontic treatment of two cases of mandibular molar with radix entomolaris, their identification and treatment. It highlights the diagnostic importance of cone-beam computed tomography (CBCT) in endodontic management of mandibular molars having three/extra roots.

Key words: Radix entomolaris, CBCT.

Introduction

Requirements for a successful root canal therapy are thoroughly cleaned, shaped and three-dimensionally obturated canals[1]. Thorough knowledge of root canal anatomy is a prerequisite for successful endodontic treatment because failure to locate any root canal will leave an unclean canal which will compromise the treatment outcome[2,3]. The goals of successful endodontics are the total obliteration of the pulp space and perfect sealing of the apical foramen with an inert filling material. For this, location and negotiation with subsequent cleaning and shaping, of the root canal system is necessary. Pécora et al (1992) affirms that one of the main reasons for the failure of root canal therapy is the lack of sufficient knowledge concerning the anatomy of teeth, both internal and external[4].

Anatomical variations are an acknowledged characteristic of mandibular permanent molars. A majority of mandibular molars have two roots; however, a third root in 5.2% of first molars and 1.5% of second molars has also been reported[5,6,7]. The incidence of three roots in human mandibular molars is greater in people of Mongolian origin than in those of Caucasian origin[4]. Skidmore and Arne (1971) studied the internal anatomy of 45 mandibular first molars and observed that 6.7% presented two canals, 64.4% three canals and 28.8% four canals. They reported that the mesial root had three canals in 6.7% of the teeth while the presence of two canals in these roots was 93.3%. The distal root presented one canal in 71.1% of the teeth and two canals in 28.9% of the teeth[5]. Stroner et al (1984) published a clinical case of a mandibular first molar with five root canals distributed as follows: two in the mesial root, two in the disto-buccal root and one canal in the disto-lingual root[6]. Isolated cases of mandibular first molar with six and seven root canals have also been reported in literature[7].

Endodontic success in teeth with the aforementioned number of canals requires a careful clinical and radiographic inspection[8]. A significant constraint in conventional radiography is that it produces a 2D image of a 3D object, resulting in the superimposition of the overlying structures. Therefore, these radiographs are of limited value in cases with complex root canal anatomy[9]. Interpretation and appraisal based on a two dimensional radiograph may alert the clinician to the presence of aberrant anatomy but would not be able to present the variable morphological structure of root canals and their interrelations. Hence, it is mandatory to use all the available diagnostic aids to locate and treat the entire root canal system. Cone beam computed tomography

(CBCT) has been specifically designed to produce undistorted image of maxillofacial skeleton as well as 3D images of & surrounding tissues. Also in CBCT, substantially lower radiation dose is required when compared to conventional CT[10].

The purpose of this article was to report endodontic management of two cases of mandibular molars with radix entomolaris using CBCT. This case report highlights the importance of CBCT for success in endodontic therapy.

Case Reports

Case Report 1: A 24-year-old woman in good health sought treatment for pain on mastication in the region of the left mandibular first molar. Clinical examination of the left mandibular first molar revealed a large carious lesion that had resulted in pulp exposure. The tooth was sensitive to palpation and percussion. A preoperative periapical radiograph **(fig. 1)** showed unusual root anatomy but provided little information about the number of roots and root canals. A 3D CBCT image (i-CAT Vision; Xoran Technologies, Imaging Sciences International, Hatfield) revealed the presence of an additional distolingual root (Radix entomolaris) **(fig.2)**. The conventional access cavity revealed the presence of 3 canal orifices, 2 mesial and 1 distobuccal. The access cavity was enlarged distolingually by means of Endo-Z bur (Dentsply Maillefer, Ballaigues, Switzerland) and distolingual canal orifice was located. Coronal flaring was accomplished with Gates Glidden burs (sizes 3 and 4) (Dentsply Maillefer). The working length for each canal was determined with an electronic apex locator (Root ZX, J Morita, Tokyo, Japan) and confirmed with periapical radiograph **(fig. 3)**. The canals were instrumented using rotary Protaper files (Dentsply, Maillefer) under copious irrigation with 5% sodium hypochlorite (NaOCl). After being cleaned and shaped, the canals were dried and obturated by cold lateral condensation technique using gutta percha (Dentsply Maillefer) and sealer (AH Plus, Dentsply DeTrey, Konstanz, Germany) **(fig. 4)**. After 2 week recall, the patient was clinically asymptomatic.

Case Report 1

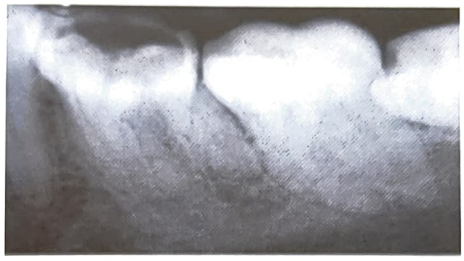

FIG 1: Diagnostic X-ray

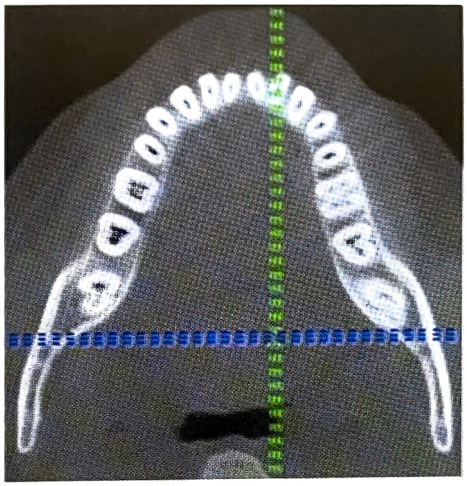

FIG 2a: CBCT demonstrates axial 2-D slices of 36 showing extra root; Coronal third

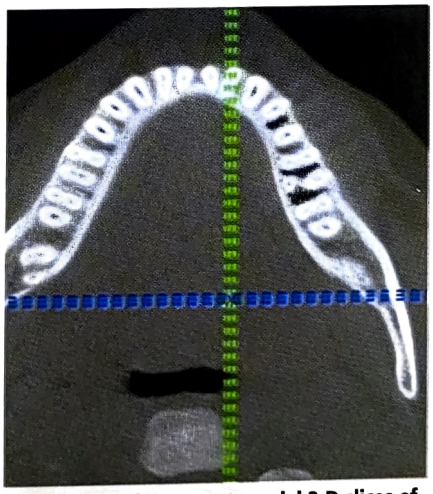

FIG 2b: CBCT demonstrates axial 2-D slices of 36 showing extra root; Middle third

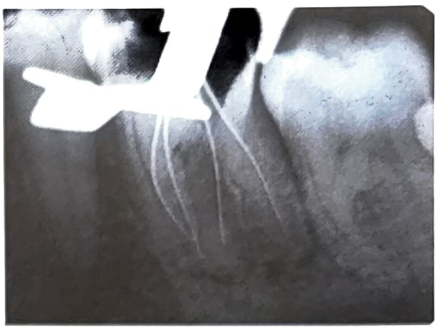

FIG 3: Working length X-ray

FIG 4: Post obturation X-ray

Case Report 2: An 18-year-old male reported with pain on mastication in relation to his mandibular right first molar. Clinical examination of the right mandibular first molar revealed a large occlusal carious lesion with pulp exposure. The tooth was tender to palpation and percussion. A preoperative periapical radiograph **(fig. 5)** revealed loss of lamina dura and PDL space widening periapically yet showed unusual root anatomy and provided little information about the number of roots and root canals. A 3D CBCT image (i-CAT Vision; Xoran Technologies, Imaging Sciences International, Hatfield) revealed the presence of an additional distolingual root (Radix entomolaris) **(fig. 6)**. The access opening was modified with extension to the distolingual to locate the radix orifice **(fig.7)**. Root canal

Case Report 2

FIG 5: Diagnostic X-ray

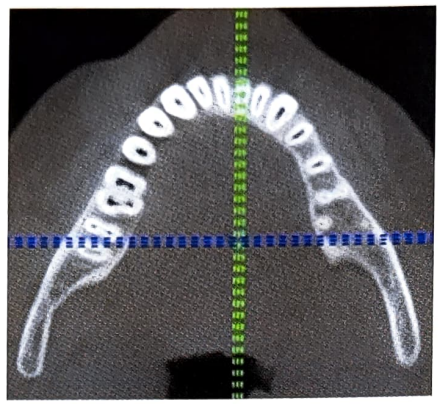

FIG 6a: CBCT demonstrates axial 2-D slices of 46 showing extra root; Coronal third

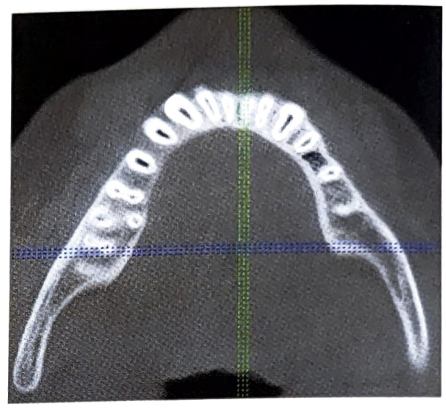

FIG 6b: CBCT demonstrates axial 2-D slices of 46 showing extra root; Middle third

treatment was performed with rotary Protaper files (Dentsply, Maillefer) in the same way as in case 1 **(fig. 8)**. Patient was completely asymptomatic after 2 week recall.

Discussion:

In this era of advanced endodontics and diagnostics, finding variations in root canal system anatomy is not uncommon. Careful clinical examination and radiographic interpretation can aid the clinician to successfully treat cases with such internal anatomy. The understanding of this view enables the possible location of additional canals in any tooth requiring endodontic treatment. The present clinical article demonstrates the efficacy of CBCT in diagnosing anatomical complexities in root canal systems. Additional canals/roots can be located in any case undergoing endodontic treatment making the clinicians aware of aberrant internal anatomy.

Radix entomolaris (RE) can be present on the first, second and third mandibular molar, occurring least frequently on the second molar. Some studies reported a bilateral occurrence of the RE from 50% to 67%[11]. The presence of a separate RE in the first mandibular molar is associated with certain ethnic groups. In Eurasian and Indian populations the frequency is less than 5%[12]. Skidmore and Bjorndal (1971) stated that approximately one third of mandibular first molars studied had four root canals[5]. Therefore, in these teeth the traditional triangular access form should be changed into a more rectangular form in order to permit better visualization and exploration for a possible fourth canal in the distal root. Because the (separate) RE is mostly situated in the same buccolingual plane as the distobuccal root, a superimposition of both roots can appear on the preoperative radiograph, resulting in an inaccurate diagnosis.

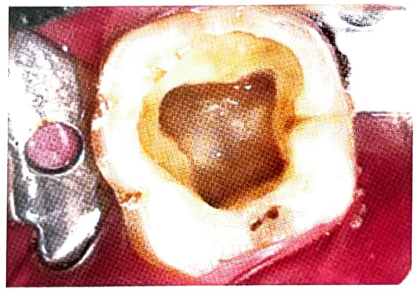

FIG 7: Orifice of extra canal (RE)

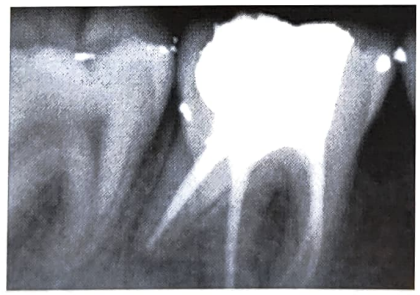

FIG 8: Post obturation X-ray

Conventional radiographs are of limited value in cases with complex root canal anatomy. Interpretation and appraisal based on a 2D radiograph may alert the clinician to the presence of aberrant anatomy but would not be able to present the variable morphological structure of root canals and their interrelations[13].

Nance et al (2000) showed that computerized tomography imaging showed a significant increase in canal detection as compared to conventional radiography[14]. Gopikrishna et al (2008) advocated the use of spiral computerized tomography for the confirmatory diagnosis of a morphological aberration in the maxillary first molar[15].

CBCT has existed since 1980s; however the convergence of technology and its application has only recently taken place. CBCT uses a cone shaped beam instead of the fan shaped one used by regular CT. An outstanding review by Taylor et al (2007) reported on the many possible endodontic application of CBCT[16]. Simon et al (2006) reported that the CBCT provided more accurate diagnostic information than biopsy and histology when evaluating large periapical lesion[17]. The advantages of CBCT over conven-

tional CT include increased accuracy, higher resolution, scan time reduction, and dose reduction[18,19,20,21]. CBCT has great potential to become a valuable diagnostic & treatment planning tool in modern endodontic practice[22].

Conclusion

Although the incidences of root and canal variations are rare, every effort should be made to find and treat all canals for successful clinical results. CBCT because of its increased accuracy, higher resolution, scan time reduction, and dose reduction was found to be very effective in management of rare cases of molars with extra root.

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