

Radix Entomolaris

Nishant Gandhi¹, Roshan Shetty², Anuradha Patil³, Rahul Kumar⁴

Abstract

Variation of root canal anatomy is always a challenge for accurate diagnosis and successful endodontic therapy. A thorough knowledge of most common anatomic characteristics and their possible variations is essential for the clinician. The hard tissue repository of the human dental pulp takes on numerous configurations and shapes. These aberrations occur so often that they can be considered as normal anatomy. Radix entomolaris (RE) is one such aberration where an extra root is present on the distolingual aspect of mandibular first molar (molar with 3 roots). This article presents one case report of mandibular first molars with extra roots which was successfully treated.

Key Words - Radix entomolaris, endodontic treatment, anatomic variations

Introduction

The treatment of the entire root canal system is essential to maximize the possibility of obtaining success in the endodontic therapy. It is necessary for the clinician to have a thorough knowledge of the dental anatomy as well as of its variations.¹ It is known that the mandibular first molar can display several anatomical variations. The majority of Caucasian first molars are two-rooted with two mesial and one distal canal^{2,3}. In most cases the mesial root has two root canals, ending in two distinct apical foramina. Or, sometimes, these merge together at the root tip to end in one foramen. The distal root typically has one kidney-shaped root canal, although if the orifice is particularly narrow and round, a second distal canal may be present⁴. A number of anatomical variations have been described in the mandibular first molar: Fabra-Campos^{5,6} and Bond⁷ reported the presence of three mesial canals and Stroner⁸ noted the presence of three distal canals. Like the number of root canals, the number of roots may also vary. An additional third root, first mentioned in the literature by Carabelli⁹, is called the radix entomolaris (RE)¹⁰. This supernumerary root is located distolingually in mandibular molars, mainly first molars (Fig. 1). An additional root at the mesiobuccal side is called the radix paramolaris (RP). The identification and external morphology of these root complexes,

containing a lingual or buccal supernumerary root, are described by Carlsen and Alexandersen^{11,12}.

In spite of high prevalence of RE in certain races, its incidence among the Indian population is found to be low and only 5.97%¹³. This case report is about the detection and management of radix entomolaris (RE) in a mandibular first molar during its root canal treatment.

Case Report

A 35-year-old male patient reported to the dental office with complaints of pain on chewing in right posterior tooth. On clinical examination, there was a gross decay in mandibular right first permanent molar (46). Tooth was tender on percussion. Radiographically the presence of widened periodontal ligament space (PDL) in the mesial roots and the presence of a third root between the mesial and distal roots were evident (Fig.2). The condition was diagnosed as chronic periapical periodontitis and the treatment plan was endodontic therapy followed by full coverage restoration.

Under local anaesthesia with 2% lidocaine access opening was done in 46. The first distal canal was found slightly away from the center (buccally) indicating the presence of the other canal on the lingual side. Upon visual inspection with a microscope (OPMI Pico, Zeiss, Zwentem, Belgium), a dark line was observed between the distal canal orifice and the distolingual corner of the pulp chamber floor. At this corner overlying dentin was removed with a diamond bur with a noncutting tip (Diamendo, Dentsply Maillefer) and a second distal canal orifice was detected (Fig. 2). The access cavity preparation was modified from a triangular to trapezoidal outline form and the fourth canal was located. The root canals were explored with DG16 endodontic explorer and the patency of the canals was verified with a size 10 K

1 Lecturer

2 Lecturer

3 Lecturer

4 Lecturer

Address for Correspondence :

Dr. Nishant Gandhi

Dept. of Conservative Dentistry & Endodontics

MGM Dental College & Hospital, Navi Mumbai,

Mob : +91-9920551004

E- mail: dr.nishant.gandhi@gmail.com



Fig 1

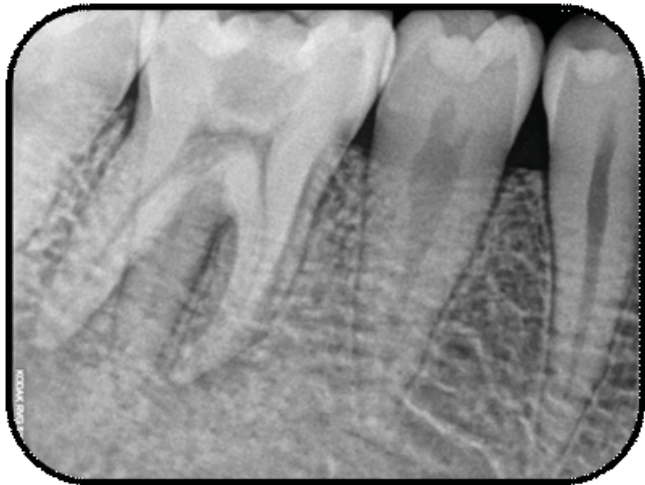


Fig 2: Preoperative X-ray



Fig 3: Access cavity

file. The canal length was determined electronically using Root ZX II (J Morita, USA) and the root canals were shaped with ProTaper rotary instruments (Dentsply Maillefer). During preparation, File Eze (Ultradent Products Inc., South Jordan, UT) was used as a lubricant and the root canals were disinfected with a sodium hypochlorite solution (2.5%). Calcium hydroxide (RCCal, Prime dent, India) intracanal medicament given and patient was recalled after 7 days.

At next appointment patient was asymptomatic. Master cone radiograph revealed proper fitting of

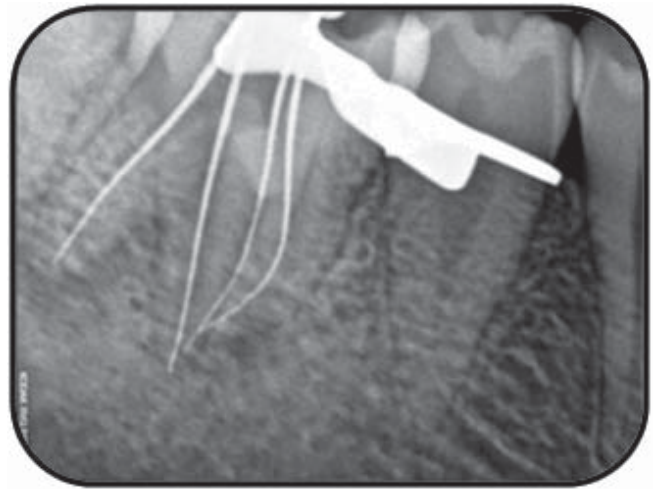


Fig 4: Working length determination

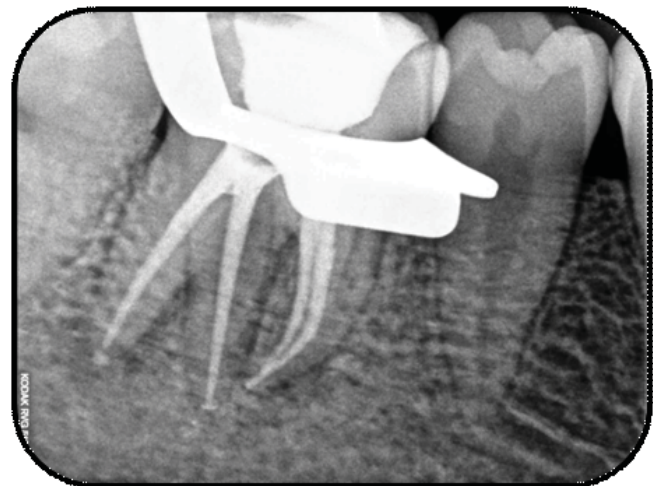


Fig 5 : Obturation

and obturated with 6% gutta percha points and AH plus sealer (Dentsply DeTrey, Konstanz, Germany) using lateral condensation technique (Fig.5). The access cavity was restored with Type IX GIC (Fuji) cement.

Discussion

The success of endodontic therapy depends on the root canal morphology to some extent. Many anatomical variations of mandibular molars have been documented in the literature. Morpho-anatomic changes in teeth may be divided according to the site of their occurrence; i.e., tooth crown, roots and root canals. Third root anomalies may develop during bud morpho differentiation as a result of a developmental aberration of both ectoderm and mesoderm¹⁴.

A classification by *Carlsen* and *Alexandersen* describes four different types of RE according to the location of the cervical part of the RE.¹⁵

Type A and B - Distally located cervical part of the

RE with two normal and one normal distal root components, respectively.

Type C – Mesially located cervical part,

Type AC - Central location, between the distal and mesial root components.

This classification allows for the identification of separate and nonseparate radix entomolaris.

According to the classification of *De Moor et al*, based on the curvature of the separate RE variants in buccolingual orientation, three types can be identified.¹⁶

Type I - refers to a straight root/root 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.

Unusual anatomy of the mandibular first molar is reported in several studies. The presence of two distal

roots is rare but does occur. This additional root can usually be found distolingually, and was recently mentioned in the literature by De Moor et al as “radix entomolaris” (RE)¹⁷. The prevalence of three-rooted mandibular first molars in extracted teeth, according to published literature, is given in Table 2¹⁸.

Apart from the awareness about the possible existence and the racial prevalence of RE, it can be detected by thorough inspection of pretreatment radiographs, especially those taken from different angles. Intra-oral periapical radiographs may serve as an important aid in identifying RE¹⁹. It is suggested that the radiographs double periodontal ligament images or unclear view of distal root/canal indicate the possibility of RE²⁰. In the present case, all the radiographs taken during the root canal procedure were clearly suggestive of RE and prevented the need for further investigations like cone-beam computed tomography and 3-dimensional reconstruction which are useful to study the morphology of RE in a noninvasive manner.

The presence of and RE or an RP has clinical implications in endodontic treatment. The (separate) RE is mostly situated in the same buccolingual plane as the distobuccal root, and resultant superimposition of both roots can appear on the preoperative radiograph, resulting in an inaccurate diagnosis. A thorough inspection of the preoperative radiograph and interpretation of particular marks or characteristics, such as an unclear view or outline of the distal root contour or the root canal, can indicate the presence of a ‘hidden’ RE. To reveal the RE, a second radiograph should be taken from a more mesial or distal angle (30 degrees). Clinical inspection of the tooth crown and analysis of the cervical morphology of the roots by means of periodontal probing can facilitate identification of an additional root. An extra cusp (tuberculum paramolare) or more prominent occlusal distal or distolingual lobe, and lingual pulp chamber wall can be explored with DG 16 explorer to reveal overlying dentin or pulp roof remnants masking the root canal entrance. The calcification, which is often situated above the orifice of the RE, has to be removed for a better view and access to the RE. However, care should be taken not to remove an excessive amount

Table 2 – Survey of available studies: Prevalence of three rooted mandibular first molars

Study	Year	Prevalence (%)	Population
Taylor	1899	3.4	United Kingdom
Tratman	1938	5.8	Chinese
Tratman	1938	0.2	Indians
Turner	1971	5.8	American Indian
Skidmore and Bjorndal	1972	2.2	Caucasians
Yones et al	1990	2.92	Saudi
Loh	1990	7.9	Chinese
Yew and Chan	1993	21.5	Chinese
Gulabivala et al	2001	10.1	Burmese
Gulabivala et al	2002	13	Thai
Huang et al	2007	21.7	Taiwanese
Tu et al	2007	17.77	Taiwanese
Schafer et al	2009	0.68	Germans
Garg et al	2010	5.97	Indian

of dentin on the lingual side of the cavity and orifice of the RE. A severe root inclination or canal curvature, particularly, in the apical third of the root (as in a type III RE), can cause shaping aberrations such as straightening of the root canal or a ledge, with root canal transportation and loss of working length resulting. The use of flexible nickel-titanium rotary files allows a more centered preparation shape with restricted enlargement of the coronal canal third and orifice relocation. Therefore, after relocation and enlargement of the orifice of the RE, initial root canal exploration with small files (size 10 or less) together with radiographical and electronic root canal length determination, and the creation of a glide path before preparation, are step-by-step actions that should be taken to avoid procedural errors.

The presence of and RE or an RP has clinical implications in endodontic treatment. The (separate) RE is mostly situated in the same buccolingual plane as the distobuccal root, and resultant superimposition of both roots can appear on the preoperative radiograph, resulting in an inaccurate diagnosis. A thorough inspection of the preoperative radiograph and interpretation of particular marks or characteristics, such as an unclear view or outline of the distal root contour or the root canal, can indicate the presence of a 'hidden' RE. To reveal the RE, a second radiograph should be taken from a more mesial or distal angle (30 degrees). Clinical inspection of the tooth crown and analysis of the cervical morphology of the roots by means of periodontal probing can facilitate identification of an additional root. An extra cusp (tuberculum paramolare) or more prominent occlusal distal or distolingual lobe, and lingual pulp chamber wall can be explored with DG 16 explorer to reveal overlying dentin or pulp roof remnants masking the root canal entrance. The calcification, which is often situated above the orifice of the RE, has to be removed for a better view and access to the RE. However, care should be taken not to remove an excessive amount of dentin on the lingual side of the cavity and orifice of the RE. A severe root inclination or canal curvature, particularly, in the apical third of the root (as in a type III RE), can cause shaping aberrations such as straightening of the root canal or a ledge, with root canal transportation and loss of working length resulting. The use of flexible nickel-titanium rotary files allows a more centered preparation shape with restricted enlargement of the coronal canal third and orifice relocation. Therefore, after relocation and enlargement of the orifice of the RE, initial root canal exploration with small files (size 10 or less) together with radiographical and electronic root canal length determination, and the creation of a glide path before preparation, are step-by-step actions that should be taken to avoid procedural errors.

Conclusion

Clinicians should be aware of these unusual root morphologies in the mandibular first molars in

Indian population. The initial diagnosis of a radix entomolaris or paramolaris before root canal treatment is important to facilitate the endodontic procedure, and to avoid 'missed' canals. Pre-operative periapical radiographs exposed at two different horizontal angles are required to identify these additional roots and its root canal orifice will result in a modified opening cavity with extension to the distolingual. The morphological variations of the RE in terms of root inclination and root canal curvature demand a careful and adapted clinical approach to avoid or overcome procedural errors during endodontic therapy.

Acknowledgements

The authors would like to thank Dr Sabita Ram, Dean Dept. of M.G.M Dental College, Navi Mumbai for supporting me for the publication. Also I would like to thank Dr. Vanitha Shenoy & Dr. Richard Pereira for helping me throughout the publication.

References:

1. Rayhani MF, Rahimi S, Shahi S. Root canal therapy of a mandibular first molar with five root canals: a case report. *IEJ* 2007; 2(3):110-2.
2. Barker BC, Parson KC, Mills PR, Williams GL. Anatomy of root canals. III. Permanent mandibular molars. *Aust Dent J* 1974; 19:403-13.
3. Vertucci FJ. Root canal anatomy of the human permanent teeth. *Oral Surg Oral Med Oral Pathol* 1984; 58:589-99. Thoden Van Velzen SK, Wesselink PR, De Cleen MJH. *Endodontologie*, 2nd ed. Bohn Stafleu Van Loghum, Houtem/Diegem, 1995:142-3.
5. Fabra-Campos H. Unusual root anatomy of mandibular first molars. *J Endod* 1985; 11:568-57.
6. Fabra-Campos H. Three canals in the mesial root of mandibular first permanent molars: a clinical study. *Int Endod J* 1989; 22:39-43.
7. Bond JL. Clinical management of middle mesial root canals in mandibular molars. *J Endod* 1988; 14:312-4.
8. Stroner WF. Mandibular first molar with three distal canals. *Oral Surg* 1984; 57:554-7. Carabelli G. *Systematisches Handbuch der Zahnheilkunde*, 2nd ed. Vienna: Braumuller und Seidel, 1844:114. Bolk L. Bemerkungen über Wurzelvariationen am menschlichen unteren Molaren. *Zeitung für Morphologie und Anthropologie* 1915; 17:605-10.
11. Carlsen O, Alexandersen V. Radix entomolaris: identification and morphology. *Scan J Dent Res* 1990; 98:363-73.
12. Carlsen O, Alexandersen V. Radix paramolaris in permanent mandibular molars: identification and morphology. *Scan J Dent Res* 1991; 99:189-95.
13. Garg AK, Tewari RK, Kumar A, Hashmi SH, Agrawal N, Mishra SK. Prevalence of three-rooted mandibular permanent first molars among the Indian population. *J Endod* 2010; 36:1302-1306.
14. Rashid AM, Suliman AA. Incidence of third root in mandibular

- permanent first molar: an endodontic challenge. *Al-Rafidain Dent J* 2006; 6(2):194-8.
15. Carlsen O, Alexandersen V. Radix entomolaris: identification and morphology. *Scan J Dent Res* 1990; 98:363-73.
 16. De Moore RJ, Deroose CA, Calberson FL. The radix entomolaris in mandibular first molar: an endodontic challenge. *Int Endod J*. 2004; 37:789-99.
 17. Calberson FL, De Moor RJ, Deroose CA. The radix entomolaris and paramolaris: clinical approach in endodontics. *J Endod* 2007; 33:58-63.
 18. Kumar R, Patil S, Hoshing U. Bilateral mandibular first molars with anatomical variations confirmed with spiral computerized tomography. *ENDO (Lond Engl)* 2011; 5.
 19. Walker RT, Quackenbush LE. Three-rooted lower first permanent molars in Hong Kong Chinese. *Br Dent J* 1985; 9: 298-99.
 20. Chen YC, Lee YY, Pai SF, Yang SF. The morphologic characteristics of distolingual roots of mandibular first molars in Taiwanese population. *J Endod* 2009; 35: 643-5.