

Three rooted, four canalled mandibular first molar (Radix Entomolaris)

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Abstract

A mandibular first molar with two distal roots is an interesting example of anatomic variation. This paper describes case reports 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). The canals were shaped with protaper rotary files and irrigated with 5.25% sodium hypochlorite, 0.2 %w/v of chlorhexidine gluconate and normal saline as the final irrigant. The canals were then obturated with gutta-percha and AH plus sealer. These case reports show an anatomic variation of internal morphology of the tooth and points out the importance of searching for additional canals.

Key Words: Mandibular first molar, two distal roots, four canals

For root canal treatment to be successful, it is necessary to locate all root canals, debride them thoroughly and seal them completely with an inert root filling material. Unfilled canals remain a nidus for infection and can compromise treatment outcome. A clinician should be aware of the internal morphology of permanent teeth and the possible variations which may be encountered. Permanent first molar teeth are frequently affected by caries at an early age and may require root canal treatment for long-term retention. The morphology of both permanent first molars has been studied and it is accepted that the mesiobuccal root of maxillary first molars and the distal root of mandibular first molars often have more than one canal. In general, the second canal of the distal roots of mandibular first molars is more easily located and treated than the second canal in the mesiobuccal root of maxillary first molars which tends to be elusive¹. Recent studies reported a higher incidence of second canals in distal roots of mandibular permanent first molar than earlier studies^{2, 3, 5, 6} (Table 1). This could be due to better awareness of morphology amongst clinicians and to a change in the shape of access cavities to a more rectangular form as compared with the earlier triangular shape recommended. One other reason could be its inherent higher distribution in certain populations. Studies amongst the Asian populations have shown a greater tendency for a second canal in the distal roots of mandibular first molars compared with other populations⁷. This is also true with in laboratory studies (Table 1). The presence of two distal roots is rare but does occur. This additional root that can usually be found

distolingually was first mentioned in literature by De Moore et al⁸ was called “radix entomolaris” (RE)⁹. An RE was found on the first, second and third mandibular molars, occurring least frequently on the second molar⁹. Some studies reported a bilateral occurrence of the RE from 50% to 67%^{10,11}. The presence of three rooted mandibular first molar appears to be less than 3 % in blacks¹², about 3 % to 4.2% in whites¹³, less than 5 % in Eurasians and Asians populations, and approximately 5 % to more than 30 % in mongoloid traits^{10,14} (Table 2).

The present report describes two rare cases which have undergone root canal treatment in mandibular first molar with three roots (one mesial, two distal that is distobuccal and an additional distolingual (radix entomolaris -type I) and four canals (two mesial and two distal).

Case 1

A 35 year old male patient was reported to the Department of Conservative Dentistry and Endodontics, Manipal College of Dental Sciences, Mangalore, India with a complaint of pain on chewing in right lower back tooth. On clinical examination there was gross decay in mandibular right first permanent molar (#46).

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Tooth showed negative response on vitality testing, and was tender on percussion. Intra oral periapical radiograph revealed the presence of peri-apical radiolucency around both mesial and distal roots. This radiograph also showed that the tooth had an additional distolingual root (Fig.1a). Diagnosis of symptomatic apical periodontitis was made and root canal treatment was recommended. Local anesthesia (inferior alveolar nerve block) was performed. The tooth was isolated by a rubber dam, and then the access cavity was prepared with distolingual extension to provide proper access to distolingual canal. After finding orifices of the canal, a radiograph was taken to determine the working length of the canals with two instruments in mesial root and two instruments in the distal roots. Shaping and cleaning was performed using rotary pro-taper files (DENTSPLY, Maillefer, Swiss made CH-1338 Ballaigues) in crown down manner. Apical preparation was done till size F3 protaper file (master apical file). The canals were irrigated with 5.25% sodium hypochlorite, 0.2%w/v chlorhexidine gluconate (Vishal Dentocare Pvt, Ltd India) during instrumentation and finally with normal saline. The canals were then dried

with paper points, master cone selection radiograph was taken, and obturated with laterally condensed gutta percha (DENTSPLY, Maillefer, Swiss made CH-1338 Ballaigues) and AH plus sealer(DENTSPLY DeTrey GmbH, Germany) (Fig.1b). Post endodontic restoration was placed and patient was recalled for follow up and full coverage crown.

Case 2

A 28 year female patient was referred to our department for root canal treatment of right mandibular first molar (#46). A general practitioner had started the root canal treatment, but could not find all the root canals. The tooth was asymptomatic and free of any clinical signs, including tenderness on percussion, but pretreatment radiograph disclosed widening of periodontal ligament space. The diagnosis was asymptomatic apical periodontitis and root canal treatment was recommended. Like case 1, diagnostic radiograph showed presence of two distal roots (Fig.2a). Root canal procedure was performed similar to case 1 (Fig 2b). Post endodontic restoration was placed and patient was recalled for follow up and full coverage crown.

Table 1: Incidence of two canals in distal root of mandibular first molar

Author/ Year	Incidence (%)	Population group
Skidmore and Bjorndal (1971)	28.9	Caucasians
Vertucci and Williams(1974)	30	Caucasians
Yew and Chan (1993)	31.5	Chinese
Zaatar et al (1997)	29.9	Middle East
Gulabivala et al (2001)	20	Burmese
Gulabivala et al (2002)	33.4	Thai
Sen et al (2004)	46	Turkish

Table 2: Prevalence of three rooted mandibular first molars- survey of available studies

Author/year	Prevalence (%)	Population group
Taylor (1899)	3.4	United Kingdom
Tratman (1938)	5.8	Chinese
Tratman (1938)	0.2	Indians
Skidmore and Bjorndal (1972)	2.2	Caucasians
Yones et al (1990)	2.92	Saudi
Loh (1990)	7.9	Chinese (Singapore)
Yew and Chan (1993)	21.5	Chinese
Sperber and Moreau (1998)	3.0	Senegalese
Gulabivala et al (2001)	10.1	Burmese



Fig 1a: Diagnostic radiograph; an additional distal root was presented



Fig 1b: The final radiograph; all four canals obturated



Fig 2a: Diagnostic radiograph; an additional distal root was presented



Fig 2b: The final radiograph; all four canals obturated

Discussion

The internal anatomy of tooth is not always similar. A great number of variations could occur in number of roots and their shape. Most dentists are used to treating normal roots with similar traits; as a result, many failures can occur. However it must be noticed that abnormalities are rare, but it is possible that a patient referred may have one of these rare anatomic variations. The above case reports remind us that during each procedure we must expect variations, which may affect the treatment outcome. These case reports have described mandibular first permanent molar with one mesial root and two distal roots (distobuccal and distolingual). The mesial root had two canals (mesiobuccal and mesiolingual) and two distal roots with one canal each. One of the variations that can occur in mandibular first molars is radix entomolaris⁹. RE is a supernumerary distolingual root with various occurrences in different populations ranging from 3% of the African population¹² to more than 30% of the mongoloid population¹⁴. The etiology behind the formation of RE is still unclear. In dysmorphic

supernumerary roots, its formation could be related to external factors during odontogenesis or presence of an atavistic gene or polygenetic system⁸. According to Quackenbush¹⁵, the extra root occurred unilaterally in approximately 40% of all cases and predominantly on the right side. This is also likely to be true, because we found both these cases on the right side. The incidence of first mandibular molars with three distal roots is unknown. In cases of a mandibular first molar with two distal roots, the distolingual root is smaller than the distobuccal root and is usually curved¹⁶. But in these present cases both distolingual roots were straight (type-I radix entomolaris)⁸. In most right mandibular molar with two distal roots, a clinician should always check for an additional canal especially in distobuccal root. There are various methods to locate additional canals, these are as follows-

1. Knowledge of law of symmetry and law of orifice location¹⁷
2. Tactile sensation with hand instrument

3. Using various instruments like endodontic explorer, path finder, DG 16 probe and micro-opener
4. Champagne effect- bubbles produced by remaining pulp tissue in the canal, while using sodium hypochlorite in pulp chamber
5. Introral periapical radiograph
6. Digital radiography
7. Using fiber-optic illumination dental endoscopy and orascopy
8. Using surgical loupes
9. Using Operating microscope
10. Micro Computed Tomography
11. Visualization endograph using Ruddle's solution
12. Magnetic Resonance Microscopy

Both cases presented here had only single canal in distobuccal and distolingual root.

Conclusion

The high frequency of a fourth canal in mandibular first molars makes it essential to anticipate and find all canals during molar root canal treatment. The possibility of an extra root should also be considered and looked for carefully. Proper angulation and interpretation of radiographs help to identify chamber and root anatomy. In the case of an RE the conventional triangular opening cavity must be modified to a trapezoidal form in order to better locate and access the distolingually located orifice of the additional root.

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