

THE RADIX ENTOMOLARIS: A RARE ENTITY IN ENDODONTICS

Chandra Sekhar M¹
Gopi Krishna Reddy M²
Satish Kumar N³
Bhargava Reddy K⁴
Datta sai Kiran⁵

¹Professor and Head
² Professor
³Post Graduate Student
⁴Post Graduate Student
⁵Post Graduate Student

^{1,2,3,4,5} Department of Conservative Dentistry and Endodontics, G pulla Reddy Dental College and Hospital, Kurnool, Andhra Pradesh, India.

ABSTRACT:. Mandibular molars can have an additional root located lingually (**the radix entomolaris**) or buccally (**the radix paramolaris**). 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. This report discusses endodontic treatment of one Mandibular molar with a radix entomolaris or paramolaris, both of which are rare macrostructures in the Caucasian population. The prevalence, the external morphological variations and internal anatomy of the radix entomolaris and paramolaris are described. Avoiding procedural errors during endodontic therapy demand an adapted clinical approach to diagnosis and root canal treatment.

KEYWORDS: *Endodontic treatment, mandibular molar, radix entomolaris, radix paramolaris.*

INTRODUCTION

The mandibular first molar can display several anatomical variations. The common morphology that first molars exhibit is two rooted with two mesial and one distal canal^{1, 2}. Commonly the mesial root has two root canals, ending in two distinct apical foramina. 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 present³. The number of roots may also vary⁴. An additional third root, first mentioned in the literature by Carabelli⁵, is called the radix entomolaris (RE). This supernumerary root is located distolingually in mandibular molars. RE was found on the first, second and third mandibular molars, occurring least frequently on the second molar. Some studies reported a bilateral occurrence of the RE from 50% to 67%. Similarly additional root in 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 Alexandersen⁶. Pindborg⁷ reported that 20% of individuals classified as being of Mongolian descent have an extra distal root on the permanent mandibular first molar.

Case Report

A 20 year old female was referred for endodontic treatment of the Mandibular left first molar from the Department of Oral Medicine and Radiology. The patient

complains of pain in the lower left back tooth region since 1 month. The pain is gradual in onset, intermittent, throbbing and referred to the ear. Pain aggravated on consumption of hot or cold and stops on removal of stimuli. Intra oral examination shows deep dental caries i.r.t. 36 which is tender on percussion. Intraoral Periapical Radiograph (IOPA) shows radiolucency involving the coronal pulp with 3 roots having 4 root canals unusually and periapical radiolucency about 2mm is seen.(Fig.1) The root canals were patent. Patient was informed about the endodontic treatment.

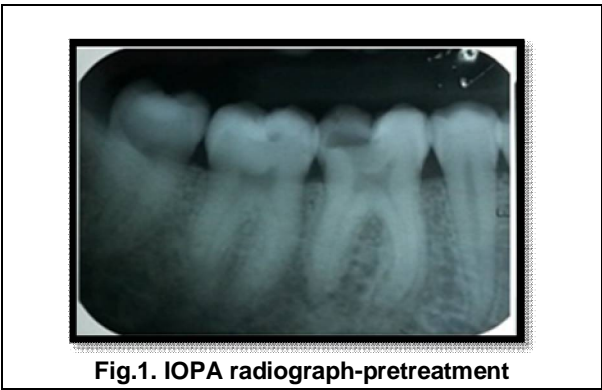


Fig.1. IOPA radiograph-pretreatment

After anaesthetizing the tooth, access preparation was done under rubber dam isolation with endo-access bur and canal orifices were located with DG 16 endodontic

explorer.(Fig.2A.) Initial negotiation of the root canals was conformed with K-file 15. The fourth disto-lingual canal orifice was present somewhere between the mesial and distal root canal orifices, more nearer to distal orifice (Fig.2B, Fig.2C and fig.2D). The canal lengths were determined radiographically with K file ISO 15 size and electronically with Root ZX. (Fig.3).They were cleaned with 2.5% sodium hypochlorite and shaped with protaper rotary system till a size of F-2, calcium hydroxide intra canal medicament was given and patient was recalled after 1 week. At next appointment patient was asymptomatic and canals were dry enough to obturate. Master cone radiograph revealed proper fitting of cones. Obturation with single cone technique using 6% gutta percha points and Calcium hydroxide based sealer (Endo Floss) was done. The access restoration was done with Fuji IX Glass ionomer. (Fig.4).

Discussion

Prevalence of Radix Paramolaris and Entomolaris :
The presence of a separate RE in the first Mandibular molar is associated with certain ethnic groups⁸. In European populations it has been reported that a separate RE is present in the mandibular first molar with a maximum frequency of 3.4–4.2% (Taylor 1899, De Souza-Freitas et al. 1971, Skidmore & Bjorndahl 1971, Curzon 1973, Ferraz & Pe´ cora 1992, Steelman 1986). In African populations (Bantu, Bushmen, Senegalese) a maximum of 3% is found (Drennan 1929, Shaw 1931, Sperber & Moreau 1998). In Eurasian and Indian populations the frequency is less than 5% (Tratman 1938). In populations with Mongoloid traits, such as Chinese, Eskimo and American Indians, the RE occurs with a frequency of 5% to more than 40% (Tratman 1938, Laband 1941, Pedersen 1949, Curzon & Curzon 1971, De Souza-De Freitas et al. 1971, Somogyl-Csizmazia & Simons 1971, Turner 1971, Curzon 1974, Hochstetter 1975, Jones 1980, Reichart & Metah 1981, Walker & Quackenbush 1985, Walker 1988, Ferraz & Pe´ cora 1992, Yew & Chan 1993, Gulabivala et al. 2001).The high degree of RE in these Mongoloid populations has provoked more specific analyses of the heritable basis of this supernumerary radicular structure (Tratman 1938, De Souza-De Freitas et al. 1971, Turner 1971, Curzon 1974). More specifically, only Curzon (1974) suggested that certain traits such as the ‘three-rooted molar’ had a high degree of genetic penetrance as its dominance was reflected in the fact that pure Eskimo and Eskimo/Caucasian mixes had similar prevalence of the trait. Apart from its role as a genetic marker, RE has significance in clinical dentistry (Carlsen & Alexandersen 1990). Whereas the RE is not typical in a Caucasian population knowledge of its occurrence and its location are important⁸.

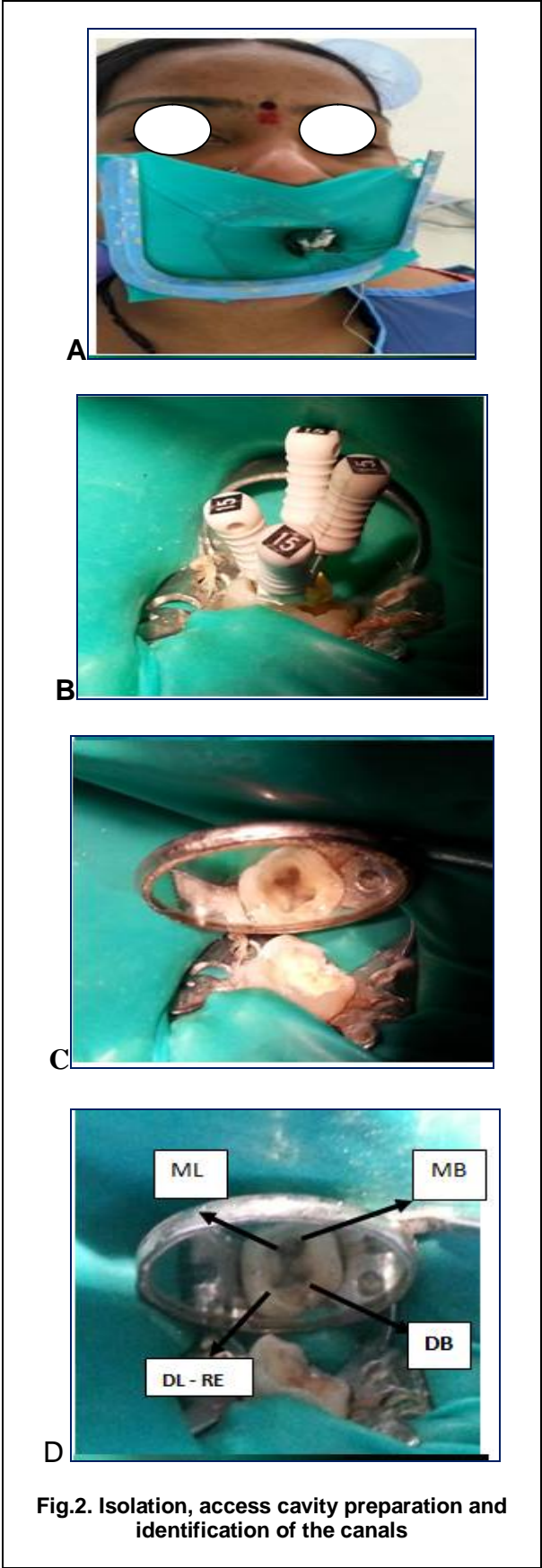


Fig.2. Isolation, access cavity preparation and identification of the canals

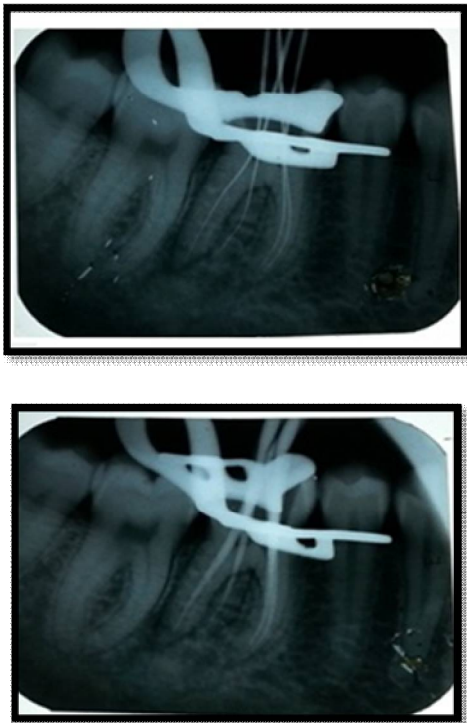


Fig.3. Radiographic confirmation of fourth canal- Distolingual in location

Morphology of the Radix Entomolaris and Paramolaris

The RE is located distolingually, with its coronal third completely or partially fixed to the distal root. The dimensions of the RE can vary from a short conical extension to a ‘mature’ root with normal length and root canal. In most cases the pulpal extension is radiographically visible. In general, the RE is smaller than the distobuccal and mesial roots and can be separate from, or partially fused with, the other roots. A classification by Carlsen and Alexandersen describes four different types of RE according to the location of the cervical part of the RE: types A, B, C and AC. Types A and B refer to a distally located cervical part of the RE with two normal and one normal distal root components, respectively. Type C refers to a mesially located cervical part, while type AC refers to a central location, between the distal and mesial root components. This classification allows for the identification of separate and nonseparate RE. In the apical two thirds of the RE, a moderate to severe mesially or distally orientated inclination can be present.

In addition to this inclination; the root can be straight or curved to the lingual. According to the classification of De Moor et al., Based on the curvature of the separate RE variants in bucco-lingual orientation, three types can be identified. Type I refers to a straight root/root canal, while 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 third⁸.

In Chinese, Eskimos, and American Indian population, studies have shown that radix entomolaris occurs in a constancy ranging from 5% to more than 30%⁹. Because of its high frequency in these populations, the o radix entomolaris is considered normal (eumorphic root morphology). In Caucasians, the radix entomolaris is not common with maximum occurrence from 3.4 to 4.2%,¹⁰⁻¹⁴. The aetiology behind the formation of radix entomolaris is still uncertain; it can be related to external factors during odontogenesis or to the penetration of an atavic gene or polygenic system (atavism is the reappearance of a trace after several generations of absence). In eumorphic roots, racial genetic factors influenced the deepest expression of a particular gene which results in the most accentuated phenotypic manifestation^{15, 16}. Curzon¹¹ suggested that the “molar of three roots” has a high degree of genetic trace penetrance; its domain reflected in the fact of which the trace prevalence was similar in pure Eskimos and in the mixture of Eskimos with Caucasians.

The radix entomolaris may be found in the first, second and third mandibular molar; its less occurrence is in the second molar¹⁷. Some studies reported a bilateral occurrence of radix entomolaris of 50-67%¹⁸. Bolk¹⁹ reported the presence of an additional root located at the buccal surface: the radix paramolaris. This macrostructure is very rare and occurs less frequently than the radix entomolaris. According to the results of a study, which was done by Tu et al.²⁰ the extra DL root for the permanent mandibular first molar occurred more frequently on the right side than on the left side.

Predictably successful root canal treatment is dependent on following the basic principles: access, cleansing and shaping, and obturation of the entire root canal system.

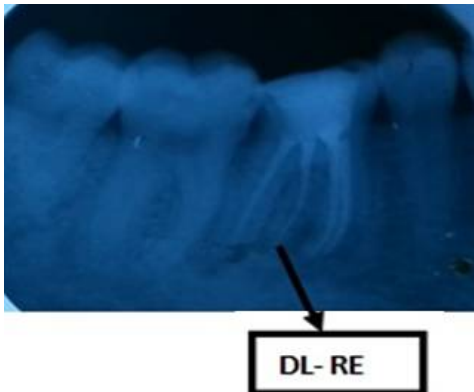


Fig.4. Post obturation radiograph showing Radix entomolaris in the distolingual canal

These principles have evolved from clinical concepts established through clinical practice and basic research. Of the three, perhaps the most important is the principle of 'straight-line' access (Christie & Thompson 1994). It should be emphasized that the ultimate objective of endodontic access is to provide access to the apical foramen, and not merely to locate the canal orifice. With the distolingually located orifice of the RE a modification of the classical triangular opening cavity to a trapezoidal form in order to better locate and access the root canal is essential; straight line access must be established. Based on the present findings (although only 18 cases) together with the data from Ribeiro & Consolaro (1997) (analysis of the structure of 54 extracted mandibular molars with RE) it was found that the majority of the radices Entomolaris were curved (in some cases with an additional curve starting from the mid root portion or in the apical third).

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. Straight-line access, in this respect, has to be emphasized as the majority of the radices entomolaris are curved.

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Corresponding Author

Dr.M.Chandra Sekhar

Professor and Head
Department of Conservative Dentistry
and Endodontics,
G Pulla Reddy Dental College and
Hospital, Kurnool,
Andhra Pradesh, India.
Phone No: 8374354145
Email; chansek171@gmail.com