CLINICAL MANAGEMENT OF RADIX ENTOMOLARIS AND RADIX PARAMOLARIS IN ENDODONTICS- CASE REPORTS

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ABSTRACT

Treatment of mandibular molars have always kept the endodontist sharp and alert as it is one of the teeth that show variations in its external and internal morphology to the extreme. This reaches its epitome in the presence of an additional root located lingually (the radix entomolaris) or buccally (the radix paramolaris). When present an awareness and understanding of this unusual root and its root canal morphology contributes to the successful outcome of root canal treatment. This report discusses endodontic treatment of two mandibular molars with a radix entomolaris or paramolaris. The prevalence, the external morphological variations and internal anatomy of the radix entomolaris and paramolaris are described.

***KEY WORDS**: 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 [3]. Sometimes these merge together at the root tip to end in one foramen [4, 5]. 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 present [6, 7]. The number of roots may also vary. An additional third root, first mentioned in the literature by Carabelli [8], is called the radix entomolaris (RE) [9]. This supernumerary root is located distolingually in mandibular molars. 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 Alexandersen.[10,11]. Although rare, knowledge of their occurrence, location, identification and management are important. The prevalence, external morphological variations and internal anatomy of the radix entomolaris and paramolaris are described in two case reports.

Case Report I

A 42-year-old male came for endodontic treatment of mandibular right first molar. On clinical examination the tooth was grossly decayed and radiographically the presence of a third root between the mesial and distal roots were evident (Fig 1 A). Access preparation was done with endo-access bur and canal orifices were located with DG 16 endodontic explorer. Initial negotiation of the root canals was performed with k-file 10. The fourth disto-lingual canal orifice was present between the mesial and distal root orifices.

The canal lengths were determined radiographically and electronically with K file ISO 15 size (fig 1 B).They were cleaned with 17% EDTA and 5.25% sodium hypochlorite and shaped with protaper rotary system and obturated with 2% gutta percha points and zinc oxide eugenol sealer (Fig1. C,D). The access restoration was done with Fuji IX glass ionomer.

Case Report 2

A 37 year old came for endodontic treatment of mandibular right first molar. On clinical examination the tooth was grossly decayed and had a distal amalgam restoration and radiographically the presence of a third root

between the mesial and distal roots were evident (Fig. 2 A).

Access preparation was done with endo-access bur and canal orifices were located with DG 16 endodontic explorer. Initial negotiation of the root canals was performed with k-file 10. The fourth canal was present mesiobuccal to the distal orifice.

The canal lengths were determined radiographically and electronically with K file ISO 15 size (Fig.2B). They were cleaned with 17% EDTA and 5.25% sodium hypochlorite and shaped with protaper rotary system and obturated with 6% gutta percha points and zinc oxide eugenol sealer (Fig2. C, D). The access restoration was done with Fuji IX glass ionomer.

Discussion

Prevalence of Radix Paramolaris and Entomolaris The presence of a separate RE in the first mandibular molar is associated with certain ethnic groups. In African and Indian populations the frequency is less than 5% and so it is considered as unusual or dysmorphic root morphology [12]. In populations with Mongoloid traits (such as the Chinese, Eskimo and American Indians) reports have noted that the RE occurs with a frequency that ranges from 5% to more than 30% [12-19]. Because of its high frequency in these populations, it is considered to be a normal morphological variant (eumorphic root morphology).

Radix entomolaris/paramolaris can be found on the first, second and third mandibular molar, occurring least frequently on the second molar [20]. Bolk [21] reported the occurrence of a buccally located additional root: the RP. This macrostructure is very rare and occurs less frequently than the RE. The prevalence of RP, as observed by Visser [20], was found to be 0% for the first mandibular molar, 0.5% for the second and 2% for the third molar.

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 to penetrance of an atavistic gene or polygenetic system (atavism is the reappearance of a trait after several generations of absence). In eumorphic roots, racial genetic factors influence the more pronounced phenotypic manifestation [17, 19].

Morphology of the Radix Entomolaris and Paramolaris A classification by Carlsen and Alexandersen[10] describes four different types of radix entomolaris 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 root components. This classification allows for the identification of separate and non-separate RE.

De Moor et al. [22] classified RE based on the curvature in bucco-lingual orientation into three types. Type I refers to straight root or 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. In the first case report the RE was present between the mesial and distal roots cervically and was straight in morphology. So it is a type AC and a type I radix entomolaris (Fig.1 A).

Carlsen and Alexandesen[11] describe two different types of radix paramolaris. Type A refers to an RP in which the cervical part is located on the mesial root complex and type B refers to an RP in which the cervical part is located centrally between the mesial and distal root complexes as can be seen in (Fig.2 A).

Clinical Approach

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 through 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,

Case No.1

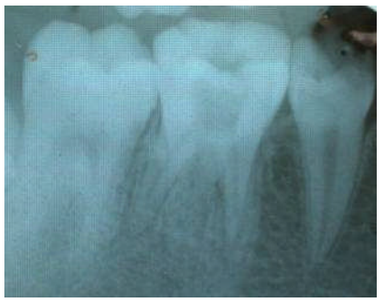
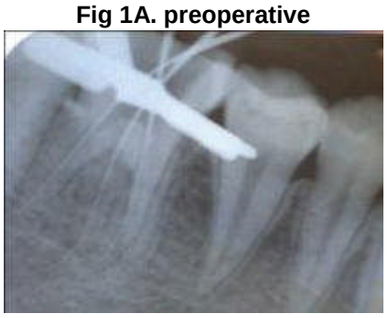


Fig 1A. preoperative



1B. working length

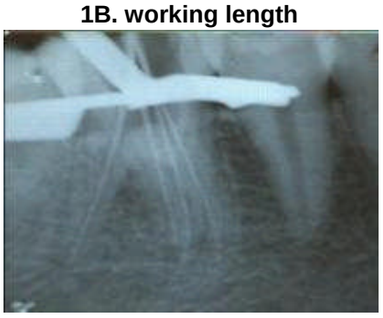


Fig. 1C. master cone

Fig .1D.obturation

Case No.2

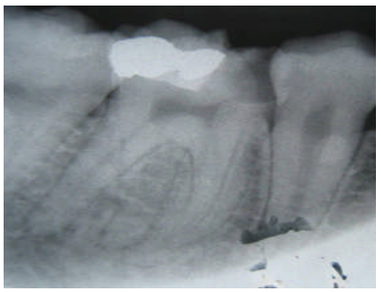


Fig 2A. preoperative

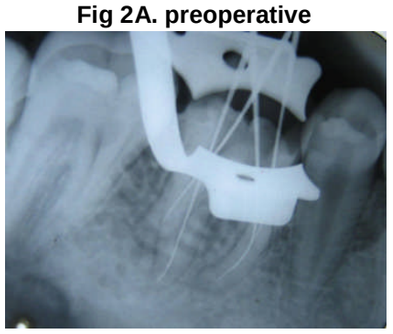


Fig 2B. working length

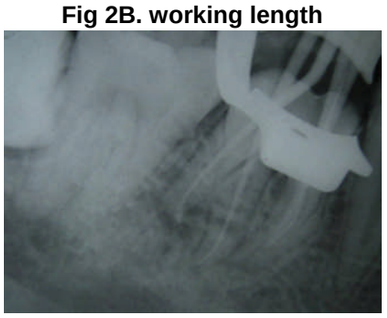


Fig. 2C. master cone

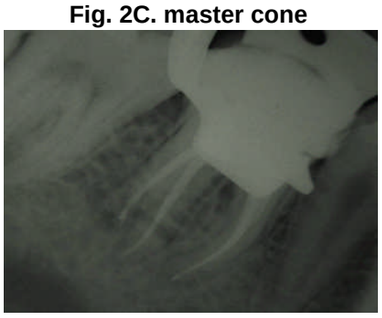


Fig .2D. obturation

in combination with a cervical prominence or convexity, can indicate the presence of an additional root. If an RE or RP is diagnosed before endodontic treatment. One knows what to except or where to look once the pulp chamber has been opened. The orifice of the RE is located disto-to mesio-lingually from the main canal or canals in the distal root. An extension of the triangular opening cavity to the (disto) lingual results in a more rectangular or trapezoidal outline form. If the RE canal entrance is not clearly visible after removal of the pulp chamber roof, a more thorough inspection of the pulp chamber floor and wall, especially in the distolingual region, is necessary. Visual aids such as a loupe, intra-oral camera or dental microscope can, in this respect, be useful. A dark line on the pulp chamber floor can indicate the precise location of the RE canal orifice. The distal

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 and 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 periapicals 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.

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