Original Research Paper

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Dental Science

RADIX : AN ENIGMA FOR ENDODONTISTS

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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 a mandibular molar with a radix paramolaris.

KEYWORDS : Radix paramolaris, unusual morphology, endodontic treatment

INTRODUCTION

According to Swartz, Skidmore and Griffen, mandibular first molars have a significantly lower success rate compared with other teeth[1]. Missed canals and the failure to remove all the microorganisms and pulp remnants from the root canal system are probably the main reasons for persistent infection around endodontically- treated molars[2]. It is therefore important that clinicians have an awareness and good understanding of the variations in root canal morphology of the mandibular first molar. Permanent mandibular first molars in Caucasian populations are generally two rooted teeth (one mesial and one distal root) with two mesial and one distal root canals[3,4]. The two mesial root canals can end up in two distinct apical foramina or they can merge together at the root tip end into one apical foramen[5].

According to Calberson *et al*. (2007) the etiology behind the formation is still unclear but it could be related to external factors during odontogenesis. Racial genetic factors can also influence profound expression of a particular gene that can result in the more pronounced phenotypic manifestation[6].

Classification (de moor)(Figure1)

Types	Features
Type I	No curvature
Type II	Curvature in the coronal third and straight continuation to the apex
Type III	Curvature in the coronal third and additional buccal curvature from the middle third to the apical third of the root.
Small type	Root length less than half that of the distobuccal root.
Conical type	Cone-shaped extension with no root canal

Figure – 1 Classification (Carlsen and Alexandersen)

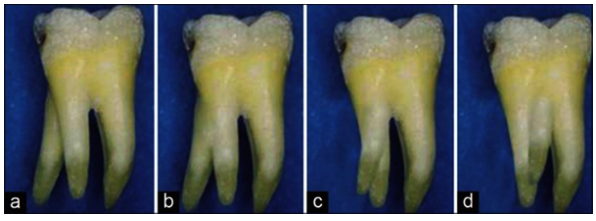


Figure - 2

Carlsen and Alexandersen's classification of RE. (a & b) Types A and B refer to a distally located cervical part of the RE with two normal and one normal distal root components, respectively, (c) Type C refers to a mesially located cervical part, (d) AC refers to a central location, between the distal and mesial root component.

Case Report

Case 1 :

A 45 year old female patient was referred to the Department of Conservative Dentistry and Endodontics for endodontic treatment of the mandibular left first molar. On clinical examination the tooth was decayed and showed signs of irreversible pulpitis. Radiographic examination showed presence of a third root ,which is indicative of Radix (Fig. 3)

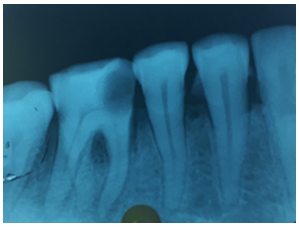


Figure – 3(IOPA Radiograph)

Further a CBCT scan was done to verify the position of the radix. The CBCT scan revealed that the root is present on the buccal side which is indicative of Radix Paramolaris.(Fig.4)

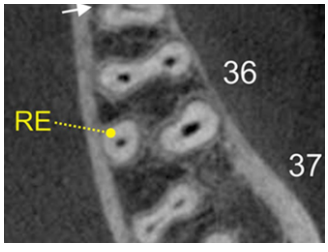
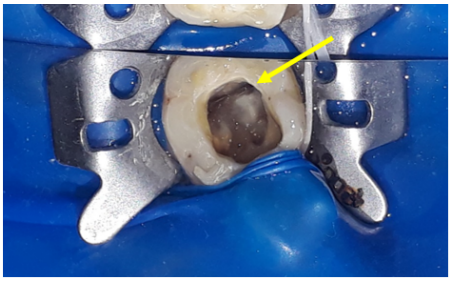


Figure – 4(CBCT Scan)

After the location of canal was assessed , the access preparation was done under rubber dam with endo-access bur and canal orifice was located with DG 16 endodontic explorer. Initial negotiation of the root canals was confirmed with K- file 15. The fourth canal (disto buccally) was located between mesial and distal root canal orifice, more nearer to distal orifices (Fig.5)



The canal lengths were determined radiographically with K file ISO 15 size and electronically with Dentaport Root ZX (J Morita) . Cleaning was done with 17% EDTA and 3% sodium hypochlorite and shaped with Protaper Gold rotary system till a size of F-2. A temporary calcium hydroxide paste and temporary filling were put in place. The root canals were filled with gutta-percha and AH26 (De Trey Dentsply, Konstanz, Germany). The opening cavity was sealed with glass ionomer cement Fuji IX (GC Corp., Tokyo, Japan). This was confirmed with the help of an IOPA Radiograph (Fig .6)

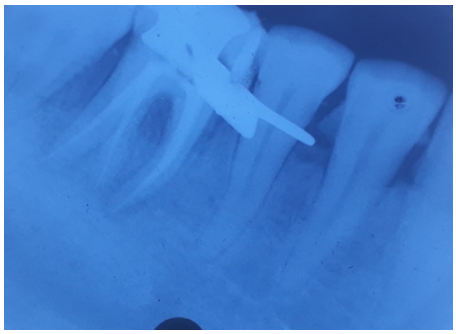


Figure – 6 (Post Obturation Radioraph)

Case 2 :

A male patient came to the department of Conservative Dentistry and Endodontics ,with a complain of pain in the lower left back tooth region . On clinical examination the tooth was decayed and showed signs of irreversible pulpitis. Radiographic examination of which showed the presence of an extra root which is indicative of radix (Fig . 7) .

Access opening was done under rubber dam after anesthesizing the tooth with endo-access bur and canal orifice was located with DG 16 endodontic explorer. Initial negotiation of the root canals was confirmed with K- file 15. The extra canal was found more nearer to the distal orifice. The canal lengths were determined radiographically with K file ISO 15 size and electronically with Dentaport Root ZX (J Morita) (Fig 8).

Cleaning was done with 17% EDTA and 3% sodium hypochlorite and shaped with Protaper Gold rotary system till a size of F-2 . Master cone radiograph revealed proper fitting of cones (Protaper GP-DENTSPLY) . The cone fit, with radiographic exposure taken at 300 mesial angulation confirmed the presence of an RE .

Figure – 7 (Pre operative IOPA)

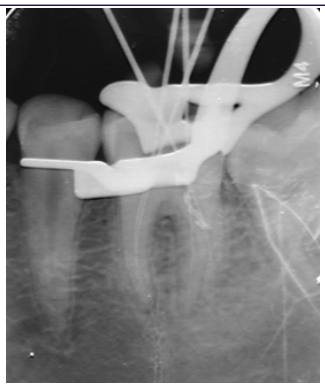


Figure – 8 (Working Length)

The canal were filled gutta-percha and AH26 (De Trey Dentsply, Konstanz, Germany). and the opening cavity was sealed with Fuji IX (GC Corp., Tokyo, Japan). This was confirmed with the help of an IOPA Radiograph (Fig 9)

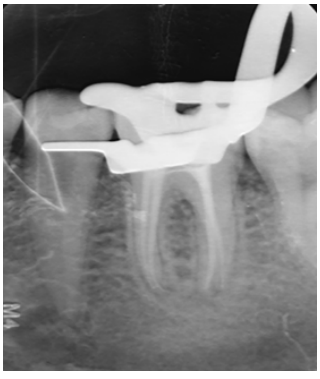


Figure – 9(Post Obturation Radiograph)

DISCUSSION

Radix entomolaris, first described by Carabelli, is an anatomical variant in the first permanent mandibular molar typically characterized by an additional third root located distolingually. RE occurs in first, second and third molars with the lowest prevalence in second mandibular molars[7 8 9] . Although the presence of RE differs within associated ethnical groups, it should be regarded as a normal anatomical variation within the Mongoloid population. Studies show no significant predilection for gender or side distribution with bilateral occurrence ranging between 50-67% [10].Understanding the complexity of the anatomical variants seen in the first permanent mandibular molar proves to be invaluable in the clinical approach when treating these cases endodontically.

Matherne *et al* (2008) showed that CBCT images result in the identification of a greater amount of root canal systems in teeth compared to conventional radiography. The study also concluded that the combination of CBCT scanning with the dental operating microscope were important diagnostic tools for locating and identifying root canals[11].

Protaper Gold (Dentsply/Maillefer) was used for root canal preparation for most of the cases depicted in this article. The key benefits of Protaper Gold include simplicity, excellent cutting efficiency and predictable final canal shape to allow for cone fit with tug-back. Another benefit of the system is the fact that the instrument is manufactured from M-wire and not traditional nickel titanium alloy. Research by Johnson *et al* (2008) demonstrated that the M-wire alloy could reduce cyclic fatigue by 400% compared with similar instruments manufactured from conventional nickel titanium alloys.46 The added metallurgical benefit contributes towards more flexible instruments, increased safety and protection against instrument fracture[12]

CONCLUSION

The successful outcome of root canal treatment depends to a large extend on access, cleaning and shaping and three dimensional obturation of the entire root canal system. CBCT

technology as well as proper angulation when acquiring radiographic images proves helpful in locating canals in especially first mandibular molars with a high incidence of anatomical variations. A thorough understanding of the prevalence of RE, its anatomical variations as well as radiographic and clinical diagnosis will provide the clinician with a better understanding of its complexity in order to ensure successful treatment outcomes.

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