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Case Report

Radix Entomolaris – A Case Report

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ABSTRACT

Success of endodontic treatment depends on the proper identification of all the canals, thorough chemo-mechanical preparation followed by three dimensional obturation with hermetic seal. Inability to do so will result in persistence of the infection. Failure of any of these steps may occur due to unusual tooth morphology. Usually mandibular molars have two roots with three canals (mesiobucccal, mesiolingual & distal) but in few teeth, the number of roots and canals vary. Radix entomolaris (RE) is a variation sometimes present in mandibular molars, wherein the tooth has an extra root attached to its lingual aspect. Irrespective of the type of file system used, an accurate diagnosis and careful application of clinical endodontic skill, improves the prognosis.

KEYWORDS: Radix entomolaris , Anatomical variation, Extra roots, Magnification, Middle Mesial Canal.

INTRODUCTION

Root canal anatomy and configuration has continued to demonstrate dynamic variations from individual to individual and within the same individual. A comprehensive knowledge on the root canal anatomy is a basic prerequisite for the successful endodontic treatment. The success of the endodontic therapy depends on the complete cleaning and shaping of the root canal system and the tridimensional obturation followed by impervious coronal seal. Unusual external and internal root canal morphology may lead to failure if not diagnosed. Aberrant anatomy in mandibular posterior teeth include radix entomolaris, radix paramolaris, middle mesial canal, 'C' shaped canal, root curvatures etc.

The utilization of proper magnification, adequate illumination, and knowledge of morphological variations can ensure predictability of the treatment rendered. The internal morphology of mandibular permanent first molars have several typical anatomical features, as well as a great number of anomalies. Recent literature suggests that there is a 1% to 15% chance of a fifth canal in a mandibular first molar.[1] Additional third root in mandibular molars has been first documented in literature by Carabelli, and named it **radix entomolaris**. This supernumerary root is located in distolingual position. When located in the mesiobuccal surface, the anomaly is called **radix paramolaris**.

The classification of this anamoly containing a supernumerary lingual or buccal root, is described by Carlsen and Alexandersen[2]

The incidence of radix entomolaris in Black populations is around 3%, while in Caucasians and Indians the occurrence is lower than 5%. In Chinese, Eskimos and American Indian population, studies have shown that radix entomolaris occurs ranging from 5% to more than 30%. Many dental clinicians tend to perceive a given tooth will contain a predetermined number of roots and/or canals. Although many authors have agreed on the presence of three foramina in the mesial root, only a few have reported the presence of three independent canals, which presents itself as a rare anatomic variant. [3]

The incidence of extra mesial root of mandibular molars has been reported in the literature upto 2.07% - 13.3% of the examined cases.[4] Goel et al reported that mandibular first molars had three mesial canals in 13.3%; 3.3% had four mesial canals and 1.7% had three distal canals.[5] Mid-Mesial (MM) canals are usually located centrally between the mesiobuccal (MB) and mesio-lingual (ML) canals. Vertucci and Williams first reported the presence of a middle mesial canal(MM) in a mandibular molar.[6] Statistics prove that mandibular first molars are the most

frequently treated tooth by root canal therapy in comparison to other types of teeth.[7,8]

CASE REPORT

A 25-year-old male was referred to the Department of Conservative Dentistry and Endodontics, with a chief complaint of food lodgment in lower right back region. The patient gave history of incomplete dental treatment. Past medical history was not relevant. On clinical examination, fractured temporary restoration was seen with 46 which was non-responsive to percussion. IOPA radiograph was taken which showed part of temporary restoration and separated root canal instrument in mesio- lingual (ML) canal (Fig no 1).

Figure:1 Pre-operative radiograph of mandibular right first molar showing furcation involvement with incomplete root canal obturation. Separated instruments seen in mesial roots.

Treatment Options were - 1. Nonsurgical retreatment of tooth 46 or 2. Surgical endodontic treatment

The patient's consent was obtained regarding non-surgical re-treatment or if unsuccessful in removal or bypassing the separated root canal instrument, then hemisection would be attempted. During the first appointment, rubber dam was applied. Coronal fractured temporary restoration was removed by high speed bur. An adequate endodontic access cavity was established. The pulpal floor showed two orifices for distal and two orifices for the mesial root. Precise examination of the groove between two mesial canals, the middle mesial canal orifice was revealed and explored with #10 K file. Working lengths were determined radiographically and confirmed using apex locator [Root ZX. JMorita, Japan].

The radiograph showed three mesial root canals and separation of file in Mesio-lingual (ML) canal. The mesio-lingual canal was then bypassed using file # 6 upto file # 25.

All canals were prepared in a crown down technique with ProTaper rotary instruments (Maillefer, Dentsply, Ballaigues, Switzerland). Mesial canals were instrumented till F1 and distal canals till F3. The canals were irrigated intermittently with 3% sodium hypochlorite and normal saline. EDTA gel (RC Help, Prime dental) was used for lubrication during instrumentation. The cavity was sealed with temporary restoration.

In the second visit the access cavity was re-opened and root canals were thoroughly irrigated with 3% sodium hypochlorite, normal saline. Final irrigation was done with 17% EDTA and final flush was done with saline.

Master cone was selected and verified with a radiograph of mandibular right first molar. (Fig no 2). Canals were dried using paper points and obturation was done with gutta-percha points using AH plus endodontic sealer, (Dentsply Maillefer, Ballaigues, Switzerland) using cold lateral compaction technique(Fig no 3).

Figure:2 Master cone placed in mandibular right first molar

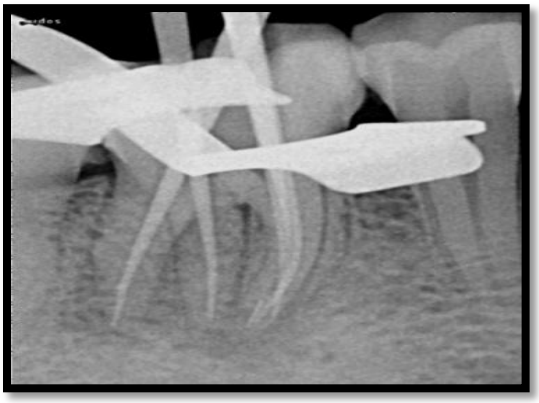

Figure:3 Obturation done in mandibular right first molar

DISCUSSION

The etiology behind the formation of the radix entomolaris (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 profound expression of a particular gene that results in the more pronounced phenotypic manifestation. Some authors also suggest RE to have a genetic predisposition.[9]

RE is most prevalent in the Mongoloid population with a frequency ranging from 5% to 30%.[10,11] On clinical examination, a more bulbous outline of the crown, an extra cusp or a more prominent occlusodistal or distolingual lobe along with a cervical convexity can be suggestive of Radix entomolaris or Radix paramolaris.

Classification by Carlsen and Alexandersen describes four different types of Radix Entomolaris according to the location of the cervical part of the Radix Entomolaris : [2]

Types A, B, C and AC.

i. Types A and B refer to a distally located cervical part of the Radix Entomolaris with two normal and one normal distal root components, respectively.

ii. Type C refers to a mesially located cervical part.

iii. Type AC refers to a central location, between the distal and mesial root components.

De Moor et al [12] had given other classification based on the curvature RE variants in the buccolingual direction. They are

Type I refers to straight root / canals ,

Type II refers to a curvature at the entrance of the orifice and

Type III refers to RE with two curvatures, one at the coronal level and the other at the middle third.

Recently Wang et al. gave another classification for R E depending on its radiographic appearance.[13]

i.Type 1: Presents the most identifiable radiographic image.

ii. Type 2: A large beam angulation is necessary mesially or distally for their identification.

iii.Type 3: Identification becomes extremely difficult because of the overlap of the adjacent distobuccal root.

A middle mesial [MM] canal sometimes is present in the developmental groove between the mesiobuccal [MB] and mesiolingual [ML] canals. The incidence of an MM canal ranges from 1% to 15%.[14] Separate apical termination of three mesial root canals is very rare.[15]Very often the middle mesial canal joins with the mesiobuccal canal at the apex.

In 1981, Pomeranz et al[16] treated 100 mandibular first and second molars in vivo in which 12 cases of separate middle mesial canals were identified and treated. He classified the middle mesial canals as falling under three types:

1. An independent canal, which originates in a separate orifice and terminates in a separate foramen.

2. A confluent canal, that originates as a separate orifice but is apically joined to the mesiobuccal or mesiolingual canal.

3. A fin, when the instrument can pass freely between the MB or ML canals.

To achieve a correct diagnosis minimum of two diagnostic radiographs are necessary using buccal object rule. On radiographic examination, a third root is visible in almost 90% of the cases.[17] Sometimes superimposition of distobuccal root can make diagnosis of RE difficult. Taking multiple radiographs with the cone-shift technique helps in identifying these extra canals.

Limitations of radiographs can be overcome by CBCT as it enables visualization of third dimension and also eliminates super-impositions. It also aids in-depth understanding of the true morphology of root canals.[18] Some of the common problems encountered during the treatment are -

1) Difficulty in Radiographic interpretation.

2) Inability to locate the fourth canal.

3) Modification in access cavity preparation.

4) Confusion in working length determination.

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.

- Using various instruments like endodontic explorer, path finder, DG 16 probe and micro-opener

-Champagne effect- bubbles produced by remaining pulp tissue in the canal, while using sodium hypochlorite in pulp chamber.

-An extra cusp (tuberculum paramolare) or more prominent occlusal distal or distolingual lobe, in combination with a cervical prominence or convexity.

Visual aids like loupes, intra oral cameras, dental microscopes with illumination will play a huge role in the identification of this anatomical feature if present. In cases of anticipated or diagnosed middle mesial canal, the mesial extension of the access cavity should extend to almost incorporate the mesiobuccal and mesiolingual cusp tips and run parallel to the mesial marginal ridge.[19,20] Access preparation should be modified usually from triangular to a trapezoidal shape, following the dentinal map.

On careful examination of the pulpal floor if a classical “white line” between the mesiobuccal and mesiolingual orifices is present the operator should further explore with small hand files for a “catch”. The preparation of this accessory canal system should be done cautiously and conservatively. The use of ultrasonic tips with their abrasive coatings helps remove (sand away) dentine conservatively. The working end of these tips can be introduced into the wall/floor angles of the pulp chamber to look for hidden systems. The use of such tips eliminates the bulky heads of conventional handpieces, which often obstruct vision, and allows this “chasing” to be carried out under direct vision.

The accurate root canal length & curvature determination along with the creation of smooth glide path is mandatory,

thus avoiding procedural mishaps. The geometry of the mesial root shows to be hourglass shaped and so a preparation in the mid section of the root is automatically closer to the danger zone (the furcation side of the mesial root), increasing the possibility of a perforation.[21]

CONCLUSION

Unusual anatomy of the mandibular first molar has been documented. Successful endodontic therapy is based on the foundation of thorough debridement and sterilization of canal system, followed by their complete obturation against future contamination. Advanced diagnostic aids help in better identification and visualization of these aberrant canals, thus predicting long-term successful endodontic therapy.

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