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Clinical Approach of a Tooth with Radix Entomolaris and Five Root Canals

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Abstract: *The endodontic treatment of a mandibular molar with aberrant canal configuration can be diagnostically and technically challenging. Radix Entomolaris (RE) is one such aberration where an extra root is present on the distolingual aspect of mandibular first molar . This article presents a case report of mandibular first molar with five root canals.*

Keywords: *Mandibular first molar, Middle mesial canal, Radix Entomolaris.*

Treatment of mandibular molars have always kept the endodontist at risk and alert as it is one of the teeth that show variations in its external and internal morphology to the extreme[1]. A major anatomical variant of the two rooted mandibular first molar is a tooth with an additional distolingual and third root: the Radix Entomolaris .This reaches its epitome in the presence of an additional root located lingually

(the radix entomolaris) or buccally (the radix paramolaris)[2]. When present an awareness and understanding of this unusual root and its root canal morphology contributes to the successful outcome of root canal treatment as unfilled canals remain a nidus for infection and can compromise treatment outcome.[1,2,3]

Several authors have reported about the morphology of the mandibular first molars [4]. These articles have shown that mandibular first molars usually have three or four canals. Along with the number of root canals, the number of roots may also vary. The majority of first and second mandibular molars are two rooted with two mesial and one distal canals [5]. A major variant in this group is the mandibular first molar which has three roots.[5]

Radix entomolaris (RE), first described by Carabelli,] is an anatomical variant found in the permanent mandibular first molar. Radix entomolaris (RE) refers to mabdibular molars having an additional root located lingually. Endodontic literatures on RE in permanent mandibular first molars reveals its incidence ranging from 0%-43.7%, with highest prevalence among the Mongolian and Eskimo traits.[6]

Calberson et al. described 4 types of RE,[7] and De Moor et
al. classified REs evaluated from extracted teeth into types I–III.[8]

- Type A & B: Distally located cervical part of the RE with two normal and one normal distal root components respectively

- Type C: Mesially located cervical part

- Type AC: Central location between the distal and mesial root components.

In apical two third of RE a moderate to severe mesially or distally oriented inclination can be present. Based on the curvature of the separate RE variants in buccolingual orientation De Moor et al. (Ribeiro & Consolaro) classified:

Type l: refers to a straight root/root canal

Type ll: refers to an initially curved entrance which continues as a straight root/root canal

Type lll: refers to an initial curve in the coronal third of root canal and a second curve beginning in the middle and continuing to the apical third.

Recently Song et al.[9] have suggested a new classification based on morphologic characteristics.8

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.

Tu et al reported that the prevalence of RE in permanent mandibular first molars differs signifi cantly with race. Endodontic literatures on RE in permanent mandibular first molars reveals its incidence ranging from 0%- 43.7%, with highest prevalence among the Mongolian and Eskimo traits. Based on different methods of investigation, the prevalence of RE is also found to be high among Taiwanese population and found to be ranging from 21.1% to 33.33%, with a bilateral incidence ranging from 53.65% to 68.57% in them. Further,

there was a signifi cantly greater incidence of RE on the right side of the mandible than on the left, but gender did not show a signifi cant relationship with this variant prevalence.[10]

This case report presents the treatment of a Radix Entomolaris in mandibular first molar with five root canals, of which three were located in the mesial root.

I. Case Report

A 29 year-old male patient presented with a complaint of pain in the posterior left mandibular region for the past two weeks. He gave a history of intermittent pain in the same region for the past three months. His past medical history was found to be non-contributory. Clinical examination revealed a carious left mandibular first molar. The clinical and radiographic findings led to a diagnosis of chronic irreversible pupitis of the left mandibular first molar, necessitating endodontic therapy.

Radiographic evaluation of the involved tooth revealed normal configuration of single mesial root with two mesial canals and also the presence of a supernumerary root in addition to a mesial and a distal root. The extra root originated from the distolingual part of the tooth and appeared to be relatively straight (fig 1). The left inferior alveolar nerve was anesthetized using 2% Lignocaine with 1:80,000 adrenaline . The tooth was isolated using a rubber dam and an endodontic access cavity was established. Examining the fissure connecting the two mesial canals revealed an additional orifice in between the two mesial canals (mesiobuccal, middle mesial, and mesiolingual). Canal exploration with a No, 10 K-file disclosed that the distal canal was extraordinarily buccally placed, indicating some sort of variation from the normal pattern. On further exploration, the second distal canal was identified. Careful examination of access cavity revealed five distinct orifices (fig2) three located mesially (mesiobuccal, middle mesial and mesiolingual) and two distally (distobuccal and distolingual). (fig3)

Multiple, working-length radiographs taken at different angulations with one file placed in each of the three mesial and two distal orifices revealed the presence of five distinct canals. (fig4) The working length radiograph confirmed the presence of 5 distinct orifices and 4 apical terminations. Cleaning and shaping was performed using a crown down preparation with hero shaper files nickel-titanium rotary instruments under abundant irrigation with 5.25% sodium hypochlorite solution and EDTA) in a 5 mL syringe. The root canals were dried with paper points master cone radiograph was taken (Fig 5) and obturated with cold, laterally condensed gutta-percha and zinc oxide eugenol sealer . Postobturation radiograph (Fig6) reveals 3 mesial canals where the middle mesial canal is joined with mesiobuccal canal , (additional types 3-2) and 2 distal canals (vertucci type 1).

II. Discussion

Endodontic success in teeth with the aforementioned number of canals and additional root requires a careful clinical and radiographic inspection[11]. An additional exposure of the concerned tooth from different horizontal projections, the standard buccal-to-lingual projection, 20 degrees from the mesial and 20 degrees from the distal reveals all the basic information regarding the anatomy of the tooth [12]. A significant constraint in conventional radiography is that it produces a 2D image of a 3D object, resulting in the superimposition of the overlying structures. Therefore, these radiographs are of limited value in cases with complex root canal anatomy [13]. Interpretation and appraisal based on a 2D radiograph may alert the clinician to the presence of aberrant anatomy but would not be able to present the variable morphological structure of root canals and their interrelations [14]. Hence, it is mandatory to use all the available diagnostic aids to locate and treat the entire root canal system [15]. Nance et al [16] showed that tuned aperture, computerized tomography imaging enabled a significant increase in canal detection as compared to conventional radiography. Gopikrishna et al [14]used spiral computerized tomography for the confirmatory diagnosis of a morphological aberration in the maxillary first molar.

Fabra et al [17] found that 20 molars (2.6%) had three canals in the mesial root. In 13 (1.7%) of those, the third canal joined the mesiobuccal canal in the apical third of the root and in 6 (1.6%) molars, the canals converged with the mesiolingual canal, also in the apical third.

Goel et al [18] reported that the mesial root of permanent mandibular first molars presented two foramina in 60% of the specimens, whereas 6.7 and 3.3% of these molars had three and four foramina respectively.

Recently, cone-beam computed tomography (CBCT) has emerged as a useful tool to aid in the diagnosis of teeth with complex root anatomies [14, 19]. It is an imaging method employing tomography to generate a three-dimensional reconstruction of the entire tooth at different levels from a single imaging procedure. The advantages of CBCT imaging are that it completely eliminates the superimposition of structural images outside the area of interest and provides a high-contrast resolution and data from a single computed tomography imaging process. Moreover, the images can be viewed in a coronal, sagittal, or even an oblique or curved image planes—a process referred to as Multi-planar Reformation (MPR). In addition, CBCT data is amenable to

reformation in a volume, rather than a slice, providing three dimensional images in the axial, coronal, or sagittal planes [20].

A dark line on the pulp chamber floor can hint towards the precise location of the RE canal orifice [21]. Once relocation and enlargement of the orifice of the RE are done, initial root canal exploration with small files (size 10 or 8) should be done along with radiographic as-sessment of root canal length and curvature determination [22,23].

Reports have been presented by Pomeranz et al3, on the incidence of third mesial canals in mandibular molars, with an occurrence ranging from 1% to 15% in vivo. However, in vitro studies have not reported such a high prevalence of three mesial canals, with most studies showing an incidence of either 0% or 1%. Pomeranz et al classified three separate morphological possibilities in the mesial root: 1) Fin--when an instrument could pass freely between the mesiobuccal or mesiolingual canal and the middle mesial canal; 2) Confluent--when the prepared canal originated as a separate orifice but apically joined the mesiobuccal or mesiolingual canal; and 3) Independent--when the prepared canal originated as a separate orifice and terminated as a separate foramen. According to this classification, first case have confluent type configuration.[24]

Kottor et al16 described the endodontic management of a mandibular first molar in a patient of Indian origin, having three distal canals within a single distal root.[25]

According to Sert & Bayirli8, this pattern has been described as Type XV canal configuration (i.e.distobuccal and mid-distal joined at the middle third of the root canal and exiting through a single apical foramen whilst the distolingual had a separate canal orifice and foramen).[26]

In the present case, all the five canals were carefully instrumented, cleaned and obturated until correct apical termination. The present report confirms that the third canal in the mesial root of mandibular first molar does occur and must be sought along the line between the two mesial canals after accessing the pulp chamber and any cervical stenosis in this zone that might cover the opening of the canals, using burs or ultrasonic tips.
Early diagnosis with an adapted clinical approach and avoiding procedural errors during endodontic therapy can lead to a successful treatment outcome in teeth presenting with this unusual anatomy of radix entomolaris.

III. Conclusion

A clinician should have complete knowledge of anatomic variation of macrostructure and internal and external root canal anatomy. The possibility of an extra root should also be considered and looked for carefully. An accurate diagnosis of these supernumerary roots can avoid complications that arise during canal negotiation and enlargement.

This case has been reported to share our experience and increase the awareness of clinicians on tooth morphology of mandibular first molar teeth for a more predictable treatment outcome.

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Legendes

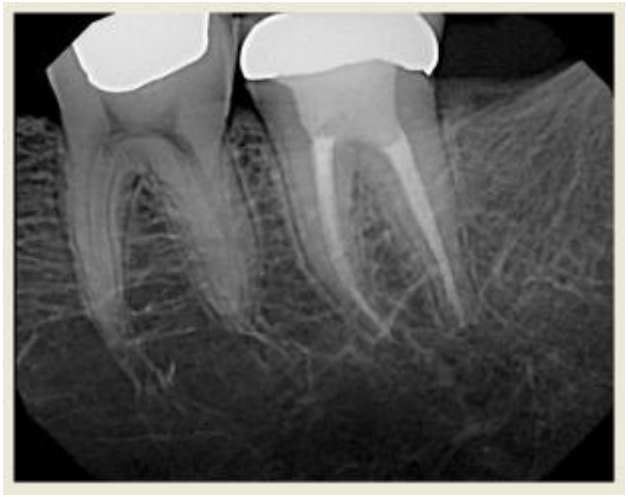

Fig 1: Preoperative radiograph with With 200 mesial angulation showed 20 0 distal angulation.

Fig 2: Working length determination

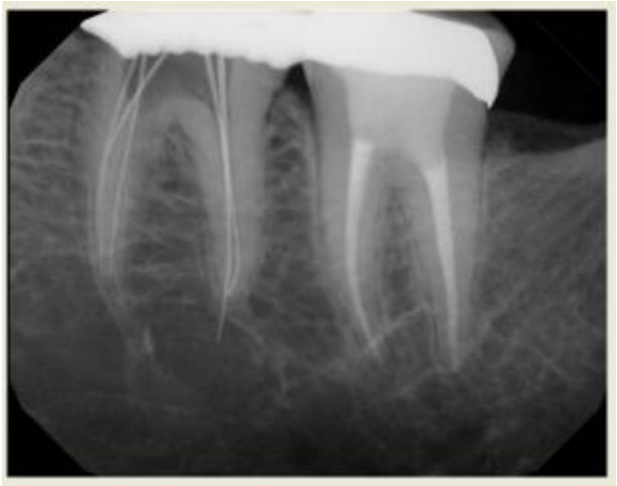

Fig 3 : Working length radiograph showed of five distinct canal orifices. confluent type of middle mesial canal

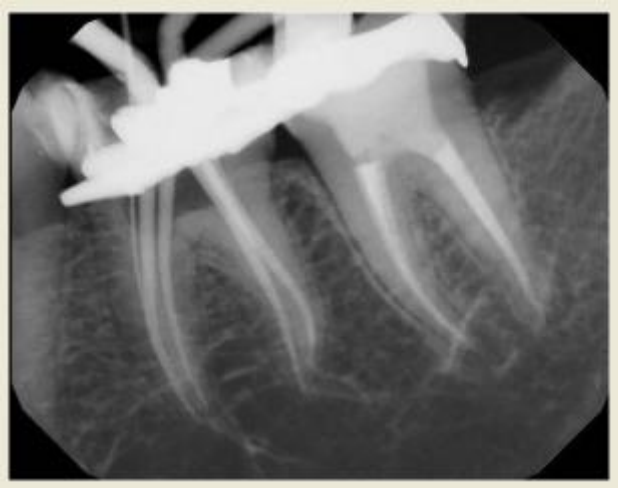

Fig 4: Master cone radiograph

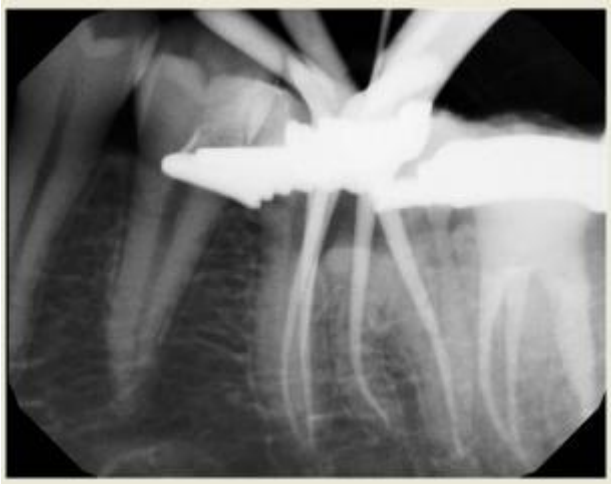

Fig 5: Showing working length determination with the help of radiograph

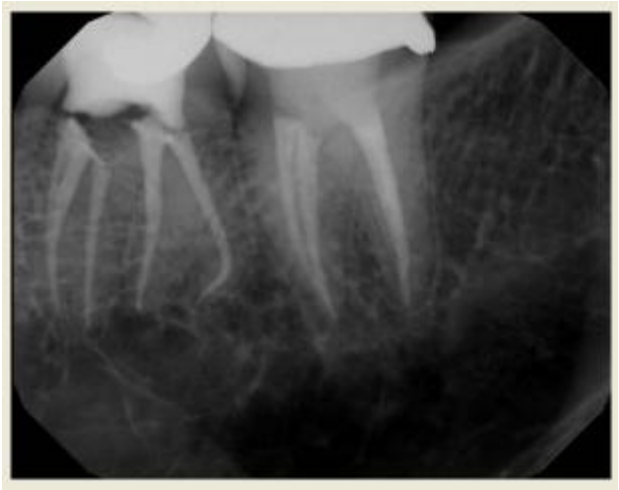

Fig 6: Post obturation radiograph showing obturated mandibular first molar with radix entomolaris and middle mesial canal