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Diagnosis and management of three rooted permanent mandibular molar: An Endodontic challenge

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Abstract- Variations in root and root canal is always a challenge and failure to recognize these variations can result in unsuccessful endodontic treatment. Mandibular molars can sometimes present a variation called radix entomolaris, wherein the tooth has an extra root attached to its lingual aspect. This additional root may complicate the endodontic management of the tooth if it is misdiagnosed or maltreated. The case reports in the present article focus on the radiographic identification and endodontic management of Radix Entomolaris in permanent mandibular first molars.

Index Terms- Anatomical Variations, Endodontic Treatment, Mandibular Molar, Radix Entomolaris

I. INTRODUCTION

A thorough knowledge of root canal anatomy is required for achieving high level of success in endodontic treatment. Failure to recognize variations in root canal anatomy may result in unsuccessful endodontic treatment. Hence, it is of utmost importance that the clinician must be familiar with all the possible variations. The permanent mandibular first molars are usually two-rooted with a mesial and a distal root [1]. The major variant in this tooth type is the presence of an additional third root, a supernumerary root found lingually (referred as distolingual root). This macrostructure, which was first mentioned in the literature by Carabelli [2], is called Radix Entomolaris (RE) [3]. Bolk reported the occurrence of a buccally located additional root: the Radix Paramolaris (RP) [4]. This macrostructure is rare and occurs less frequently than the Radix Entomolaris [5].

The prevalence of these three-rooted mandibular first molars appears to be less than 3% in African populations, not to exceed 4.2% in Caucasians, to be less than 5% in Eurasian and Asian populations, and to be higher than 5% (even up to 40%) in populations with Mongolian traits [4] and 5.97% in Indian population [6].

Achieving success and predictability in endodontics necessitates the proper identification and management of these not so common structures as failure to identify such variations will certainly increase the chances of failure.

In the present case reports, clinical approach to diagnosis and endodontic treatment of Radix Entomolaris are presented.

II. CASE REPORT 1

A 42-year-old male patient reported with a chief complaint of pain in his lower left back tooth region since two weeks. Patient gave a history of previous restoration done in the lower left second premolar, first molar and second molar. Medical history of the patient was noncontributory. On examination, the left mandibular second premolar and first molar were found to be restored with temporary restoration with tenderness on percussion in both the teeth. Electric pulp testing revealed aggravated response when compared with control teeth. Diagnostic radiograph of mandibular second premolar and first molar revealed radiopaque restoration in close proximity to pulp and widening of the periodontal ligament space (Fig 1a). Further soft and hard tissue examination revealed no other abnormality.

Close inspection of the radiograph also revealed the presence of an additional periodontal ligament space crossing the distal root leading to an impression of double periodontal ligament space on the distal aspect of mandibular first molar. This led to the suspicion of additional or extra root entity. Two radiographs with different horizontal angulations were made which confirmed that the additional root was present distolingual to the mesial root in mandibular first molar. Based on the literature evidence this supernumerary distolingual root was diagnosed as Radix Entomolaris. A diagnosis of chronic irreversible pulpitis with apical periodontitis [7] was made for both left mandibular second premolar and first molar and endodontic treatment was planned.

The teeth were anaesthetized with local anaesthesia (Lidocaine HCL Injection BP, Zymeth Wellness, Ahmedabad, Gujarat, India) and then isolated under rubber dam (Hygenic Rubber Dam Kit, Pearson Dental Supplies). The restoration was removed with round bur (Round Long Diamond Bur 801L, Jota rotary instruments, Switzerland) and access cavity was refined using an Endo Z bur (DENTSPLY Maillefer, Birmingham). A single canal orifice was located in case of premolar .One distal and two mesial canal orifices were located using an endodontic explorer (DG16 D/E Endodontic Explorer, Pin Tech Instruments, Pakistan) in left mandibular molar but upon close inspection a dark line was observed between the distal canal orifice and the distolingual corner of the pulp chamber floor. At this location overlying dentin was removed and a second distal canal orifice was located. Working length was determined using an apex locator with file no. # 15 in each canal (J.Morita Root ZX II, Scott's Dental Supply, WA) and was verified using radiographic method (Fig. 1b).

Biomechanical preparation was performed using hand protaper instruments (Dentsply Maillefer, Birmingham) upto file F2 in all the four canals of first molar and single canal of second premolar as per manufacturer's recommendation. Irrigation between each instrument was done using 2.5% sodium hypochlorite (NaOCl, Cole-Parmer, Mumbai, India). The master cone x-ray was taken using F2 protaper gutta percha points (Dentsply Maillefer, Birmingham) (Fig. 1c). The canals were obturated with F2 protaper gutta-percha and AH plus sealer (De Trey Dentsply,Konstanz, Germany) by a lateral compaction method. Post obturation restoration was done and a post-

obturation radiograph was taken (Fig. 1d). Patient was recalled after a month for follow up examination and was found to be asymptomatic.

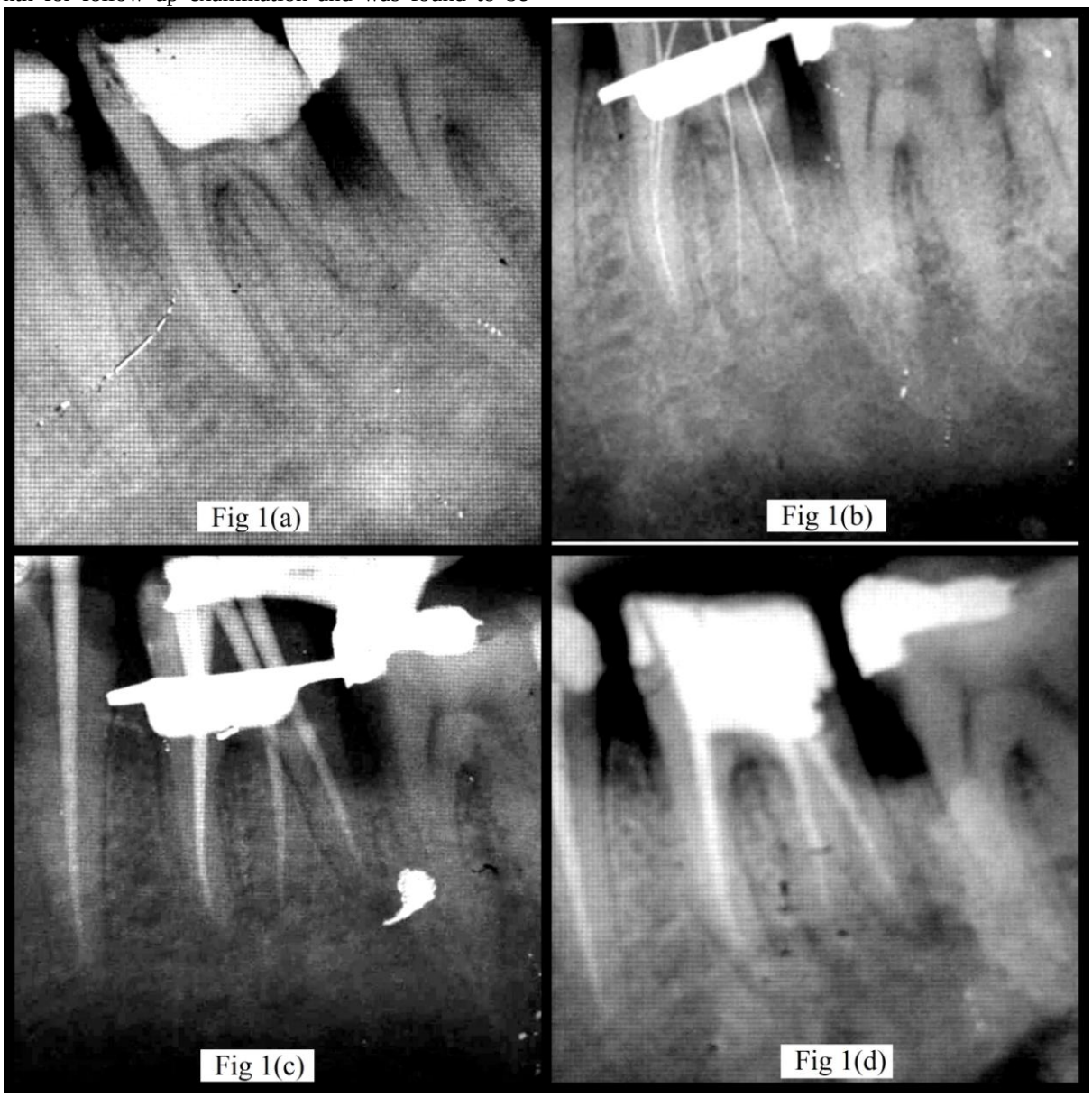

Fig 1 (a): Pre-operative radiograph. Fig 1 (b): Working length determination. Fig 1 (c): Master cone IOPA Fig 1 (d): Post-obturation radiograph.

III. CASE REPORT 2

A 15-year-old male patient reported with a chief complaint of pain in his lower left back tooth region since one week. Patient gave a history of previous dental intervention wherein a restoration was done in the lower left first molar. Pre-operative radiograph of mandibular first molar revealed a radiopaque restoration in close proximity to the pulp with a faint outline of an additional root present between the mesial and distal roots (Fig. 2a). A radiograph with mesial shift confirmed that the additional root was present distolingual to the mesial root in lower left first molar**.** This supernumerary distolingual root was diagnosed as Radix Entomolaris. Clinical examination showed restoration in lower left first molar with tenderness on percussion in lower left first molar and electric pulp testing revealed aggravated response in respect to left mandibular first molar when compared to control teeth. Further soft and hard tissue examination revealed no other abnormality. A diagnosis of chronic irreversible pulpitis with apical periodontitis [7] was made for lower left first molar.

The tooth was anaesthetised (Lidocaine HCL Injection BP, Zymeth Wellness, Ahmedabad, Gujarat, India) and isolated under rubber dam (Hygienic Rubber Dam Kit, Pearson Dental Suppliers). The restoration was removed with round bur (Round Long Diamond Bur 801L, jota rotary instruments, Switzerland) and access cavity was refined using an Endo Z bur (DENTSPLY Maillefer, Birmingham). The first distal canal was found slightly away from the centre (buccally), and thus indicating that the other canal would be on the lingual side. The access cavity

preparation was modified from a triangular shape to a trapezoidal form and the fourth canal was located. The root canals were located with an endodontic explorer (DG16 D/E Endodontic Explorer, Pin Tech Instruments, Pakistan) and patency of canals was established with K-file ISO#15. Working length was determined using apex locator with file no.# 15 in each canal (J.Morita Root ZX II, Scott's Dental Supply, WA) and was verified radiographically (Fig. 2b)**.**

Biomechanical preparation was done with hand ProTaper instruments (Dentsply Maillefer) upto file F2 in all the four canals of first molar as per manufacturer's recommendation. Irrigation between each instrument was done using 2.5% sodium hypochlorite (NaOCl, Cole-Parmer, Mumbai, India) and normal saline. The master cone IOPA was taken using F2 protaper gutta percha points (Dentsply Maillefer, Birmingham) (Fig. 2c). The canals were obturated using F2 protaper gutta-percha points and AH plus sealer (De Trey Dentsply,Konstanz, Germany) by a lateral compaction method. Post obturation restoration was done and a post-obturation radiograph was taken (Fig. 2d). Patient was recalled after one month for follow up examination and was found to be asymptomatic.

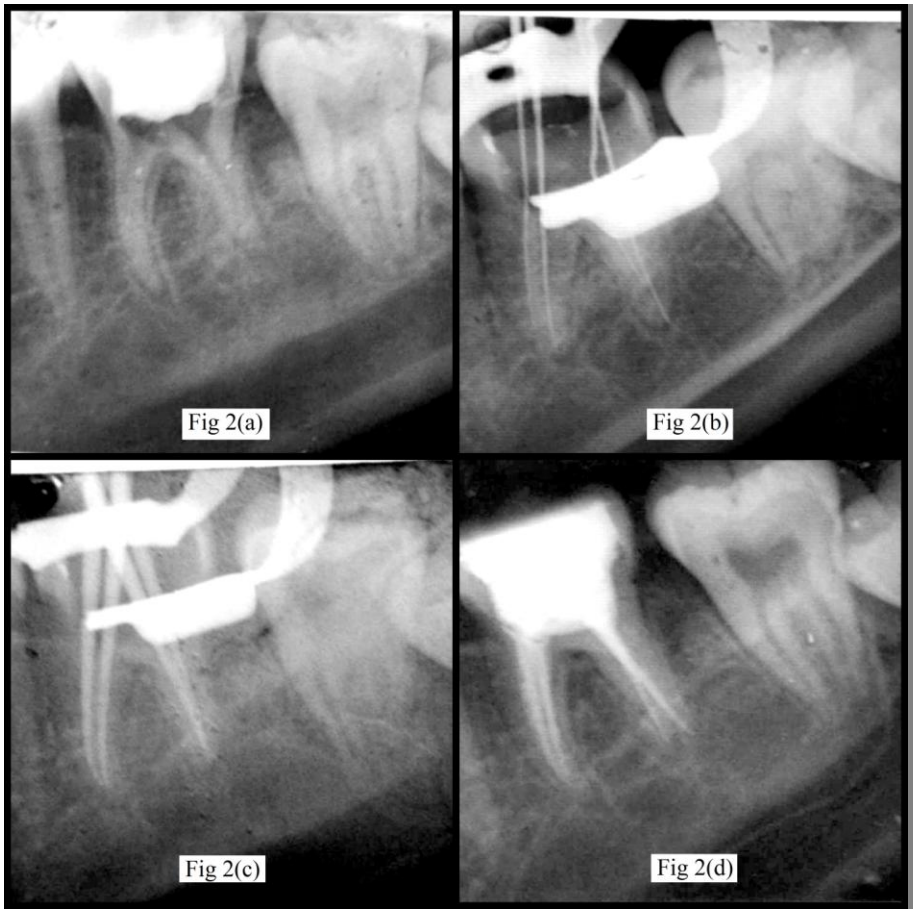

Fig 1 (a): Pre-operative radiograph. Fig 1 (b): Working length determination. Fig 1 (c): Master cone IOPA Fig 1 (d): Post-obturation radiograph.

IV. DISCUSSION

Root canal treatment should result in a thorough mechanical and chemical debridement of the entire pulp chamber and root canal, followed by complete obturation with a three dimensional seal. Radix Entomolaris poses a great endodontic challenge and inability to diagnose it can result in treatment failure. Dentists should be familiar with morphological variations to avoid missed canals. The presence of an additional distolingual root in the cases described above was detected in the preoperative radiograph itself. This signifies the importance of preoperative radiograph in the endodontic treatment [8,9]. To reveal the Radix Entomolaris, a second radiograph should be taken from a more mesial or distal angle (30 degrees) [5]. In the cases described, all the radiographs taken during the root canal procedure were clearly suggestive of Radix Entomolaris and did not warrant the need for further investigations like cone-beam computed tomography and 3-dimensional reconstruction [10].

Clinically, the possibilities of detecting and managing Radix Entomolaris can be enhanced by obtaining straight line access and modifying typical triangular shape of access preparation to a trapezoidal form. Visual aids such as a loupes, 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 an angled probe to reveal the overlying dentin or pulp roof remnants masking the root canal entrance. However, to avoid perforation or stripping in the coronal third of a severe curved root, care should be taken not to remove an excessive

amount of dentin on the lingual side of the cavity and orifice of the RE. Thus, a good knowledge of law of symmetry and law of orifices, various methods like, visualizing the dentinal map and canal bleeding points, using DG-16 explorer, micro-opener, troughing of the grooves with ultrasonic tips, staining the chamber floor with 1% methylene blue dye, champagne bubble test and micro computed tomography will be useful to locate the canals [11] .

A classification by Carlsen and Alexandersen [12] 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 [4], 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 third.

Other clinical difficulties envisaged with Radix Entomolaris would relate to extraction and orthodontic procedures, where the extra root would render extraction difficult with possible fracture of the distolingual root, because of its curvature and movement difficulty [13].

V. CONCLUSION

Clinicians should be aware of the unusual root morphologies in the mandibular molars. The initial diagnosis of Radix Entomolaris is important to facilitate successful endodontic treatment.

REFERENCES

[1] Vertucci FJ. Root canal anatomy of the human permanent teeth. Oral Surgery, Oral Medicine, Oral Pathology1984; 58(5):589-99.

[2] Carabelli G. Systematisches Handbuch der Zahnheilkunde, 2nd ed. Vienna Braumullerund Seidel, 1844, 114.

[3] Bolk L.The importance of endodontics in maxillary and mandibular molar canals. JCan Dent Assoc 1994; 60: 527-532.

[4] De Moor R, Deroose C, Calberson F. The radix entomolaris in mandibular first molars: an endodontic challenge. International Endodontic Journal 2004; 37(11):789-99.

[5] Calberson FL, De Moor RJ, Deroose CA. The Radix Entomolaris and Paramolaris:

Clinical approach in Endodontics. J Endod 2007; 33(1):58-63.

[6] Garg AK, Tewari RK, Kumar A, Hashmi SH, Agrawal N, Mishra SK. Prevalence of Three-rooted Mandibular Permanent First Molars among the Indian Population.

Journal of Endodontics 2010; 36(8):1302-5.

[7] Ingle JI, Bakland LK. Endodontics. 6th ed. Hamilton: BC Decker; 2008pp.520-31.

[8] Segura-Egea JJ, Jimenez-Pinzon A, Rios-Santos JV. Endodontic therapy in a 3-rooted mandibular fi rst molar: Importance of a thorough radiographic examination. J Can Dent Assoc 2002; 68(9): 541-4.

[9] Chen YC, Lee YY, Pai SF, Yang SF. The morphologic characteristics of distolingual roots of mandibular first molars in Taiwanese population. J Endod 2009; 35: 643–5.

[10] Tu MG, Huang HL, Hsue SS, Hsu JT, Chen SY, Jou MJ, et al. Detection of permanent three-rooted mandibular first molar by cone-beam computed tomography imaging in Taiwanese individuals. J Endod 2009; 35: 503–7.

[11] Wasti F, Shearer A, Wilson N. Root canal systems of the mandibular and maxillary first permanent molar teeth of South Asian Pakistanis. International Endodontic Journal 2001; 34(4):263-6.

[12] Carlsen O, Alexandersen V. Radix entomolaris: identification and morphology. Scan

J Dent Res 1990;98: 363–73.

[13] Loh HS. Incidence and features of three-rooted permanent mandibular molars. Aust

Dent J 1990; 35(5):434-437.

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