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RADIX ENTOMOLARIS-SERIES OF CASE REPORTS

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ABSTRACT
Wide diversity in morphology of multi-rooted teeth presents a challenge to clinicians in achieving successful endodontic therapy. Locating all the canals, shaping and cleaning and obtaining a fluid tight hermetic seal of all the root canals located within the tooth being treated defines the success of the endodontic therapy undertaken. Diagnosing the presence of ancillary canal or ancillary root can be a difficult task, which can be overcome by use of angulated radiographs, modification of conventional access opening and advanced technologies such as spiral computed tomography and cone-beam computed tomography. The present article is an attempt to represent series of case reports on extra roots associated with mandibular first molar (Radix Entomolaris) and their successful endodontic management.

INTRODUCTION

Barrett has rightly stated, "Of all the phases of anatomic study in human system, one of the most complex is that of pulp cavity morphology". Clinician should pose comprehensive knowledge of root canal morphology and associated variation. Root canals are often left untreated because the operator fails to locate when they are present, especially in teeth exhibiting anatomic irregularities or accessory or aberrant rootcanals [1,2].

The exact cause of Radix Entomolaris (RE) is still not known. Some authors say that it may be due to disturbance during odontogenesis or may be due to an atavistic gene. Incidences of RE varies from 5 to 30% and also among different populations [3]. The prevalence of three rooted mandibular molars is reported to be 2.6% among mongoloids, 1.8% among Negros, 1.7% among Caucasians as per the study reported by Ferraz and Pecora in 1993. Costa Rocha et al in 1996 reported the prevalence to be 1.5% in common population. In another study by J Segura-Egea et al in 2002, the prevalence was less than 5% in Caucasians, Africans, Eurasians and Indians and 5 to 40% in mongoloids. According to Gulabivala et al there was 13% prevalence of three rooted mandibular molars in Thai population in 2002. In yet another study by FL Calberson, RJ De Moor the prevalence was found to be 3.4 to 4.2% in European population, less than 5% in Eurasian and Indian population and 5 to 40% Mongoloid population [4,5]. The additional third root, (i.e. the supernumerary root) in permanent mandibular first molar variants that have three roots is typically distributed lingually. This was first described by Carabelli in 1844 [6] and was termed Radix Entomolaris by Bolk in 1915.[7] similarly an additional root at the mesiobuccal side of the distal root of the mandibular molar is called the Radix Paramolaris (RP). A RE can be found on the first, second and third mandibular molar, occurring least frequently on the second molar. Incidence of bilateral occurrence of RE varies between 50 to 67% [8]. According to the classification of De Moor et al. [8], based on the curvature of the separate RE variants in bucco-lingual orientation, three types can be identified (Figure-1).

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.

This article highlights three case reports on diagnosis and endodontic management of radix entomolaris.

CASE SERIES

Case 1

A 20-year-old female patient was reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of severe pain in the right lower back tooth region since five days. Patient gave history of intermittent pain, which aggravated with intake of cold beverages and persisted even after the removal of stimulus. Clinically deep proximal caries was noticed. After assessing the peiapical radiograph it reveled presences of extra root .To confirm the anatomy another radiograph was taken which with SLOB technique (same side lingual and opposite side buccal). Tooth was tender on percussion test. Vitality tests were carried out tooth was diagnosed as symptomatic irreversible pulpitis and decision was made to plan nonsurgical endodontic therapy.

Tooth was anesthetized with local anesthesia and isolated under rubber dam. An ideal ccess to the pulp chamber was gained using Endo access bur kit (Dentsply, Maillefer, Switzerland). Three canals were located (2 mesials and 1 distal). The dentine map extended towards the distolingual direction and tracing it the access was modified from a triangular to a trapezoidal shape successfully locating the extra distolingual (RE) canal. The canal patency was checked with # 10 K-file. The working length was estimated using an electronic apex locator and also confirmed with radiovisiography (RVG). Following this, the glide path for the root canals was prepared till a #20 K-file and the orifices were flared using SX (Dentsply, Maillefer, Switzerland). The root canals were then shaped using Protaper NEXT file system (X1 and X2; Dentsply, Maillefer, Switzerland). Irrigation was performed using 5.25% Sodium Hypochlorite (NaOCl) and RC-Help (Prime Dental Products Pvt. Ltd, India) was used as a lubricant between each files. Following the completion of shaping procedure 17% aqueous EDTA (Dent Wash; Prime Dental PVT Ltd, India)) was used for one minute in the canal for removal of smear layer followed by a final flush with 3ml of normal saline. After final irrigation protocol canals were dried with sterile paper points and the mastercone was selected (X2; Dentsply, Maillefer, Switzerland) and the placement was confirmed using RVG. The obturation was carried using cold lateral compaction technique with AH plus used as sealer (Figure 2 a-d).

Case 2

A 32-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with chief complaint of pain in lower left posterior tooth 36. Medical history was non-contributory. Pain was of continuous type and with disturbed sleep. Clinical examination revealed deep occlusal caries. Pain aggravated on taking hot food and even on mastication. Diagnostic radiograph showed no periapical changes. It presented radiolucency involving pulp with a faint outline of an additional root overlapping the mesial and distal roots. Thus endodontic treatment was initiated. After adequate anesthesia and rubber dam application access opening was made and three canals were located at the same time a bleeding spot was observed. Following this the decision was made to extend the access cavity to a trapezoidal shape for proper accessibility of all the canals and to rule out/locate accessory canals. The endodontic therapy was completed in a similar way as explained in Case 1. (Figure 3 a-d).

Case 3

38 year-old male patient reported to the Department of Conservative Dentistry and Endodontics with the complaint of severe pain that was continuous in nature and radiating to ear. Pretreatment radiograph showed caries involving pulp and presence of an additional root. Endodontic treatment was planed. After access preparation, the first distal canal was found slightly away from the centre (buccally), indicating the possible presence of another canal lingually. As such the access cavity preparation was modified from a triangular shape to a trapezoidal form and the fourth canal was located. The treatment followed and completed in the same way as in Case 1. (Figure 4 a-d).

Figure 1. Classification of Radix Entomolaris (RE).

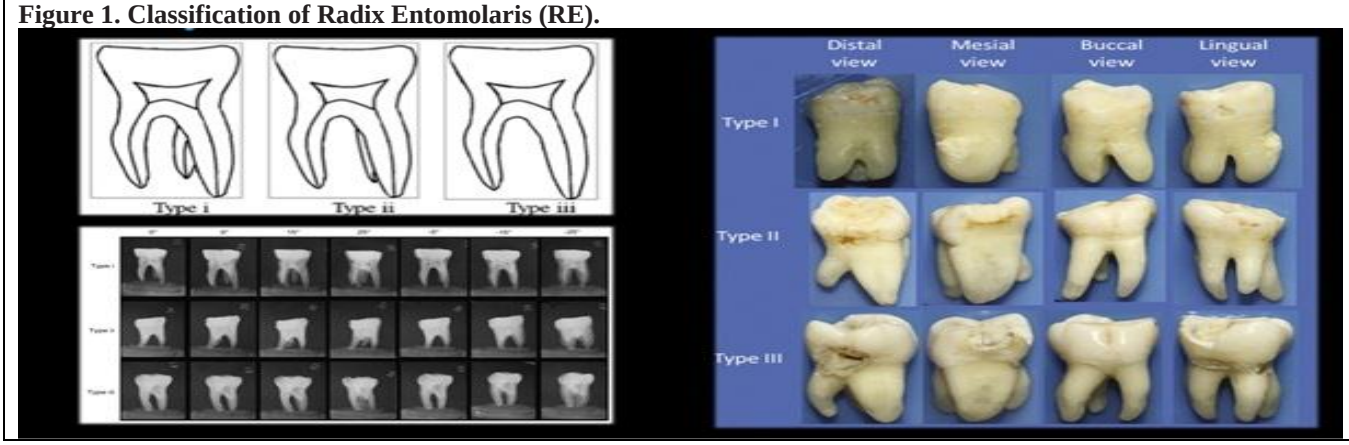


Figure 2 a-d. a) Preoperative X-ray with tooth #46 showing the presence of deep occlusal caries and extra root. b) Established working length X-ray of 46. c) Placement of selected mastercones and d) Post obturation X-ray after lateral compaction technique. (Red arrow – Radix Entomolaris)

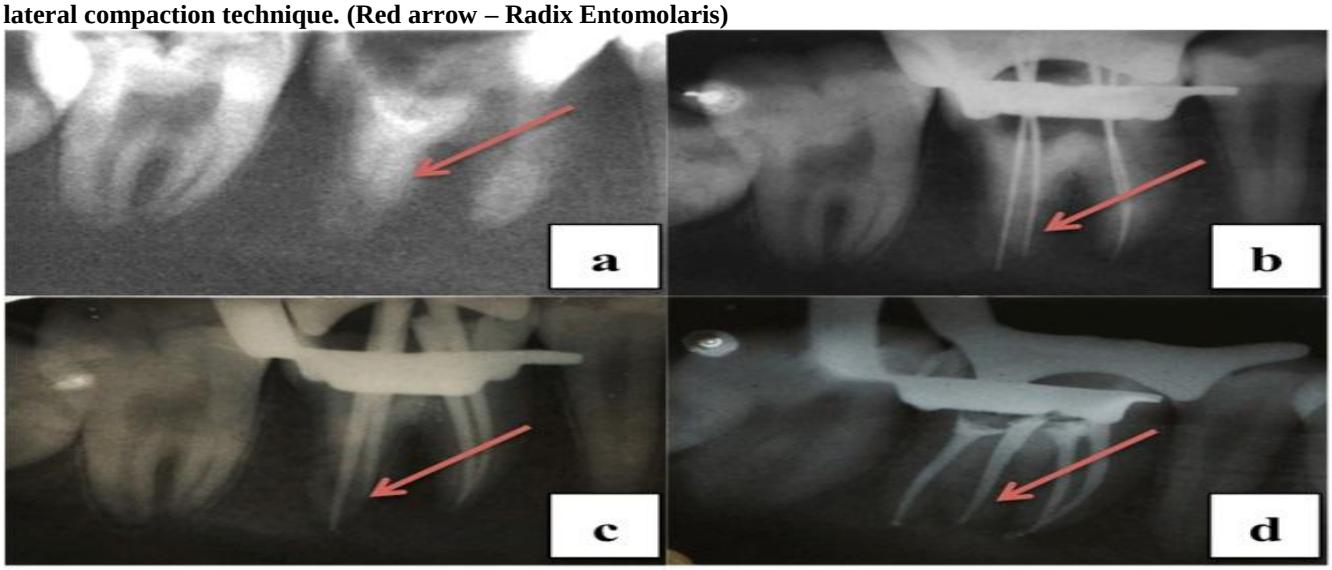


Figure 3 a-d. a) Preoperative X-ray with tooth #36 showing deep disto-occlusal cavity and an extra root. b) Established working length X-ray of 36. c) Placement of selected mastercones and d) Post obturation X-ray after lateral compaction technique.

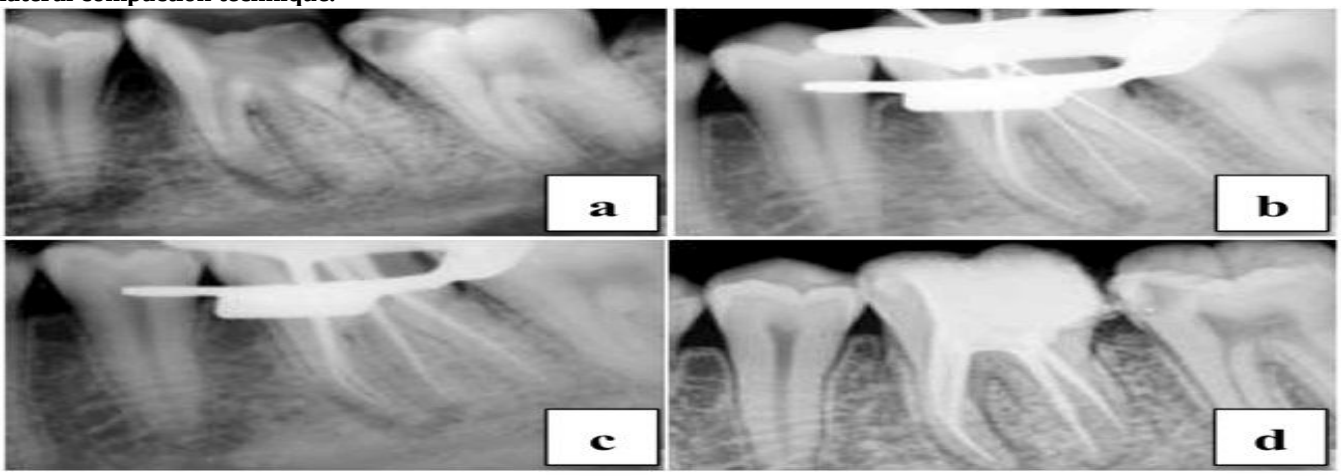
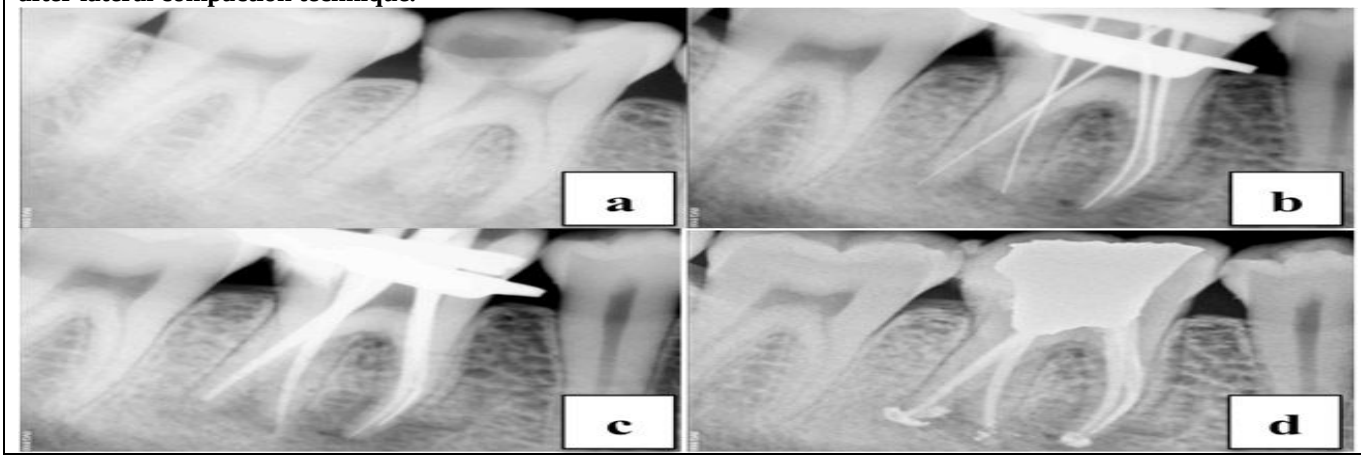


Figure 4 a-d. a) Preoperative X-ray with tooth #46 showing the presence of deep disto-occlusal cavity and an extra root. b) Established working length X-ray of 46. c) Placement of selected mastercones and d) Post obturation X-ray after lateral compaction technique.



DISCUSSION

It has been reported that endodontic treatments in mandibular first molars have a significantly lower success rate than the other teeth. One of the reasons for non-healed root canal treatment is persistent infection caused by a missing canal and failure to remove all microorganisms and pulp remnants in the root canal system. Therefore a better awareness of root canal anatomy is essential for improving the healing rate of root canal treatment of mandibular first molars [9].

RE can be found on the first, second and third mandibular molar, occurring least frequently on the second molar. Bilateral occurrence of the RE ranges from 50 to 67% [10]. Garg et al concluded that the frequency of occurrence of an extra root in the mandibular first molar is 5.27% in the Indian population [11].

Apart from the awareness about the possible existence and the racial prevalence of RE, it can be detected by thorough inspection of pretreatment radiographs, especially those taken from different angles. Intra-oral periapical radiographs (IOPAs) may serve as an important aid in identifying RE. It is suggested that the radiographs were successful in over 90% of the cases while identifying additional roots.[12] Radiographic features like double periodontal ligament images or unclear view of distal root/canal indicate the possibility of RE [9].

In all the present cases, all the radiographs taken during the root canal treatment were clearly showed RE and prevented the need for further investigations like cone-beam computed tomography and 3-dimensional reconstruction which are useful to study the morphology of RE in a noninvasive manner [13].

Diagnosis of RE can be done by

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.[14]

Apart from that

- Radiographs with different angulations
- Modification of access cavity from triangular to trapezoidal
- Knowledge of law of symmetry and law of orifices, various methods like, visualizing the dentinal map and canal, bleeding points
- Magnifying loupes
- Use of dental operating microscope
- Spiral Computed Tomography
- Cone Beam Computed Tomography

can use be helpful for identification of extra roots.

Initial preparation of canal by enlarging canal orifices and thereby removing coronal interferences achieving straight-line access are necessary and also using flexible files is important. This prevents shaping aberrations, such as straightening of the root canal, ledge formation, canal transportation because of root canal inclination or curvatures present mostly at apical third.

The most successful generational design of the past is the mechanical concept of utilizing a progressively percentage tapered design on a single file. The patent-protected ProTaper Universal Ni-Ti rotary file system utilizes both an increasing and decreasing percentage tapered design on a single file. This design feature serves to minimize the contact between a file and dentin, which decreases dangerous taper lock and the screw effect, while increasing efficiency [15]. Compared to a similarly-sized fixed tapered file, a decreasing percentage tapered file design strategically improves flexibility, limits shaping in the body of the canal, and conserves coronal two thirds dentin. Taking advantage of this mechanical design, PTN also utilizes progressive tapers on a single file. This design has contributed to the ProTaper system becoming the No. 1 selling file in the world, the No. 1 file choice of endodontists, and the No. 1 system taught international dental schools to undergraduate students [16].

CONCLUSION

Anatomical abnormalities always pose a challenge for clinician. Sound knowledge of normal and its variations should be bear in mind for success of the endodontic treatment. Careful interpretation of radiographs, radiographs with different angulations and other diagnostic aids which were described in this articles helps in managing such abnormalities like Radix Entomolaries. And use of protaper next file system for its advantages over number of files in the market which will help in gaining efficient results and saving precious time.

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