

## Research Article

### **Prevalence of Radix Entomolaris in Mandibular First Molars in south-eastern Iranian Population and series of case reports**

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**Abstract:** The aim of this study was to evaluate clinically the prevalence of radix entomolaris in mandibular first molars in south-eastern population and series of case reports. Methods and materials: 750 mandibular first molars from 406 females and 344 males received tooth canal treatment in Zahedan University of dentistry in 2-years period (2014-2015). The prevalence of a third root revealed by periapical radiographs and the comparison of the occurrence between males and females and between the right and left sides of the mandible were recorded. Statistical Analysis was done using the chi-square test with a significant level set at  $P < 0.05\%$ . In results of the 750 treated mandibular first molars, 19 teeth were RE with an overall prevalence of 2.5%. There was no significant differences in prevalence of RE between male and female. There was no significant differences in prevalence of RE between right and left sides. In conclusion practitioners must be familiar with all molars variations to reduce failures caused by missing canals and roots.**Keywords:** Mandibular first molars, Radix entomolaris, Endodontic management, Anatomical variation, Three-rooted molar, extra roots

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**INTRODUCTION**

Successful outcomes of root canal therapy depends on the identification of all roots and root canals for determination of complete extirpation of pulp tissue, chemo mechanical cleaning and shaping and proper obturation of the root canal system with suitable filling material [1]. Failure of at least one of stages causes unsuccessful root canal treatment of the tooth with a development or persistence of a periapical lesion [2].

The permanent mandibular first molar is usually two-rooted. The major variation of this tooth type is the presence of a supernumerary root which can be found disto lingually Is called Radix entomolaris (RE) [3].

Anatomical studies have reported a relation between the presence of RE in the first mandibular molar and certain races. In Mongoloid population, such as Chinese, Eskimos, and American-Indians, frequency is of 5 to more than 30% [4, 5]. In African population, a maximum frequency of 3% was found [9, 10], in Europeans the incidence was even less. in German population the frequency was 1.35% [6].

In Indian population reported 5.97% of occurrence of RE in mandibular first molars [7]. The

same method was used by Karale *et al.*; who reported a higher incidence (6.67%) of RE [8]. The purpose of this study is to evaluate the incidence of permanent mandibular first molar teeth with three roots in a south-east Iranian population using digital X-rays in two different angles.

**METHOD AND MATERIALS**

750 mandibular first molars from females and males with different ages scheduled for root canal treatment at zahedan Dentistry University in 2014-2015 years. The study sample represents all patients who needed primary root canal treatment. All teeth treated had fully formed roots. After explaining the procedure, the informed consent was taken from all the study participants .The criteria used to indicate the radix entomolaris is an independent and distinguishable root proximate to the distal root was counted as an Radix entomolaris. An additional root was radio graphically found by the intersection of the translucent lines which showed the pulp space and the periodontal ligaments.

At least two preoperative radiographies were taken for each tooth undergoing root canal treatment using a digital X-ray sensor (Dr. Suni, San Jose, California,USA). One radiograph was taken straight angle and the other taken either 20° mesially or distally

.All patients received inferior alveolar nerve block injection using local anesthesia of 2% lidocaine with 1:80000 epinephrine (Persocaine-E, Darou Pakhsh, Iran). After removing caries of the tooth, a conventional endodontic access cavity was made then Rubber dam placed for isolation. The pulp chambers were irrigated with 3% sodium hypochlorite and carefully examined with an endodontic probe (DG-16, Dentsply, and Gloucester, UK). All canals were scouted using K-file number 15 (Dentsply, Maillefer, Ballaigues, Switzerland). Working length was estimated using an apex locator (Root ZX, J. Morita Mfg Corp, Kyoto, Japan) and confirmed with radiography. The canals were initially instrumented to a size no.15 K-file (Mani INC, Tochigi, Japan), under copious irrigation with 5.25% sodium hypochlorite. Canal preparation was performed using the crown-down technique with Protaper Universal Rotary NiTi files (Dentsply, Maillefer, Switzerland). Canals were obturated using cold lateral condensation of gutta-percha (GAPADENT Co. LTD, China) and AH 26 sealer (Dentsply Tulsa). A postoperative radiograph was taken to assess the technical quality of root canal filling. Cavit was used as

a temporary filling material. Patient was referred to restorative department.

The incidence of RE and comparison of the occurrence between males and females and between the right and left sides of the mandible were recorded. Prevalence was analyzed by using the Pearson chi-square test with SPSS (20.SPSS Inc., Chicago, IL, USA).  $P < 0.05$  was considered statistically significant.

**RESULT**

750 patients with age ranged from 11 to 62(mean = 37) years old comprising 406 females and 344 males formed this study sample. 19 teeth had RE with an overall prevalence 2.5%. There was no significant difference in the prevalence of three-rooted mandibular first molars between females (7/406) and males (12/344) (Table 1) and, there was no significant difference between the right side (11/19) and the left side (8/19). Comparison of the prevalence between males and females occurrences were analyzed by using the Pearson chi-square test with SPSS (20.0; SPSS Inc., Chicago, IL, USA). ( $P < 0.05$  was considered statistically significant.)

**Table-1 prevalence of Radix Entomolaris in permanent mandibular first molar according to gender**

gender \ Radix	Subjects with radix		Subjects without radix
	Number	percentage	Number
male	12	3.5	332
female	7	1.7	399
total	19	2.5	731

**DISCUSSION**

In our study, the overall prevalence of patients with radix was 2.5%. This finding was in a range of previous reports on Middle Easterners [9, 10]. It was also close to reports from India [7,8]. However, it was low when compared with data reported for Asian races: 24.5%in Koreans [11], 32%in Chinese [12], and 25.6%inTaiwanese [13]. In the present study, there is no significant differences in the incidence of RE between males and females. The same result was reported by other studies [11, 12, 28, 30]. Considering the right and left sides of the mandible, radix molars occurred more frequently on the right side than on the left side. These findings were the same with some previous studies [7, 12] and different from others [7, 14], which reported that RE can occur more on the left side. Two studies [15, 16] found no significant difference between both sides.

These resemblances to middle easterners and Indian population and differences with Asian races are because of the race differences or the number of overall samples or using archived radiographs in those studies. In this research we include patients who needed endodontic treatment and referred to endodontic department and all of them received special treatment

and none of the patients were missed so the prevalence is real.

In this study we just took radiography of the tooth which needed endodontic treatment so the patients did not receive extra dose of radiation because of ethic issues. The presence of a third root (RE) complicates the endodontic treatment and cause failure as a result of canal missing. Clinicians should know about this morphological Abnormality. Accurate clinical and radiographic examination should be done before starting a root canal treatment. The infrequent occurrence of RE requires that the clinician be cautious in diagnosis and management of the lower molar teeth. One way of finding RE is visual inspection of the tooth crown, an additional root is often associated with an increased number of cusps and an increased number of root canals with a more prominent occlusodistal or distolingual lobe [17]. Precise radiographic diagnosis plays an important role in an endodontic treatment. Radiographs taken in different angulations show the basic information about anatomy of a tooth and can help to detect any unusual anatomy such as extra canals and/or roots [18].

There is two classifications for RE which described by De Moor et al. and Carlsen and

Alexanderson. De Moor *et al.*; have classified RE evaluated from extracted teeth into three types: Type I refer to straight roots or canal. Type II refers to an initially curved entrance which continues as a straight 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.(18)

Carlsen and Alexanderson classified RE into four types:

- Type A – Distally located cervical part with two normal distal root components.
- Type B – Same as type A but only one normal distal Component.
- Type C – Mesially located cervical part.
- Type AC – Central location between mesial and distal Root components [17, 19].

When the occurrence of RE is confirmed or suspected on the radiography, the access cavity preparation should be modified from the classic triangular access to rectangular or trapezoidal outline. The orifice of RE is mainly located disto to mesiolingually from the main distal canal. If RE canal is not clearly visible after removal of the pulp chamber roof, thorough inspection of the pulp chamber floor and wall, especially in the distolingual region, a sharp endodontic explorer (DG-16) can be useful [20]. Digital radiography was used in this study. The digital system has many advantages over the conventional radiography like being easy and fast, reduction in time between exposures and image interpretation, less radiation dosage for patient, elimination of chemical waste hazard, and the ability to digitally manipulate the captured image [21].

Cone beam computed tomography scans were recently shown to be a valuable in several stages of endodontic treatment as they provide an immediate and accurate. Three-dimensional radiographic image. Preoperatively, these images give us information about the internal and external tooth anatomy including number and location of roots and canals, root and canal curvatures, size of the pulp chamber and the degree of calcification [22]. In this study we did not use CBCT because we think although CBCT is useful but unnecessary. It has some disadvantages like extra radiation, ethic issues and being expensive. We can diagnose RE with digital radiography but in future it might be a routine part of endodontic treatments.

#### CONCLUSION:

Practitioners must be familiar with all molars variations to reduce failures caused by missing canals and roots.

#### CASE SERIES:

##### Case report 1:

A 22 years old female patient referred to Department of Endodontics with a chief complaint of( I have permanent severe pain in the left mandibular first molar tooth) . The tooth was tender to percussion. There was no mobility and periodontal status was within normal limits. Pulp vitality testing of the involved teeth with cold (DENRONIC, Aero nova GmbH & Co. KG, Germany) and electric pulp stimulation (Parkel Electronics Division, Farmingdale, NY, USA) were positive, so the provisional diagnosis was irreversible pulpitis with acute apical peridontitis A diagnostic radiograph was taken which suggested deep caries with pulpal involvement and additional root [Fig 1] was noticed. Presence of additional root was confirmed by mesially angled radiography. Local anesthesia was administered and the tooth was isolated under rubber dam. Access preparation was prepared. The access cavity preparation was modified from a triangular shape to a trapezoidal form and the fourth canal was located. Mid-mesial canal was found after exploring between mesiobuccal and disto buccal. After scouting the canals with no.10 and no.15 K-files(Mani INC, Tochigi, Japan), coronal flaring with Protaper Universal Shaping file Sx and S1 (Dentsply, Maillefer, Switzerland) was done. Working lengths were estimated with an apex locator (Root ZX, J. Morita Mfg Corp, Kyoto, Japan) and it was confirmed with periapical radiography (Figure 2). The canals were initially instrumented to a size no.15 K-file (Mani INC, Tochigi, Japan), under copious irrigation with 5.25% sodium hypochlorite. Canal preparation was performed using the crown-down technique with Protaper Universal Rotary NiTi files (Dentsply, Maillefer, Switzerland).

Final irrigation was done with 20 ml EDTA 17% then 20 ml sodium hypochlorite 5.25% followed by 20 ml normal saline irrigation. The canals were dried with paper points. Canals were obturated using cold lateral compaction of gutta-percha (GAPADENT Co. LTD, China) and AH 26 sealer (Dentsply Tulsa).(figure 3) (Figure4, 5) is final radiography of root canal treatment . Cavit was used as a temporary filling material. Patient was referred to restorative department.



Figure 1 case 1

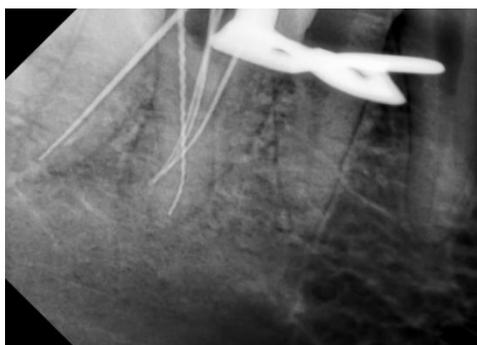


Figure 2 case 1

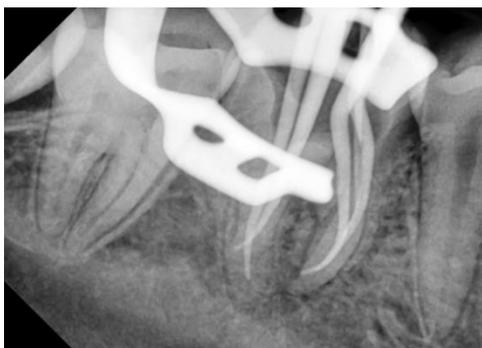


Figure 3 case 1



Figure 4 case 1



Figure 5 case 1

#### Case report 2:

A 14 years old male patient referred to Department of Endodontics with a chief complaint of (I have stimulus pain in my lower right back tooth). The tooth was not tender to percussion. There was no mobility and periodontal status was within normal limits. Pulp vitality testing of the involved teeth with cold (DENRONIC, Aero nova GmbH & Co. KG,

Germany) and electric pulp stimulation (Parkel Electronics Division, Farmingdale, NY, USA) were positive, so the provisional diagnosis was irreversible pulpitis with normal periapical status. A diagnostic radiograph was taken which suggested deep caries with pulpal involvement and additional root [Fig 1, 2] was noticed. Presence of additional root was confirmed by mesially angled radiography. Local anesthesia was administered and the tooth was isolated under rubber dam. Access preparation was prepared.

After scouting the canals with no.10 and no.15 K-files (Mani INC, Tochigi, Japan), coronal flaring with Protaper Universal Shaping file Sx and S1 (Dentsply, Maillefer, Switzerland) was done. Working lengths were estimated with an apex locator (Root ZX, J. Morita Mfg Corp, Kyoto, Japan) and it was confirmed with periapical radiography (Figure 3). The canals were initially instrumented to a size no.15 K-file (Mani INC, Tochigi, Japan), under copious irrigation with 5.25% sodium hypochlorite. Canal preparation was performed using the crown-down technique with Protaper Universal Rotary NiTi files (Dentsply, Maillefer, Switzerland).

Final irrigation was done with 20 ml EDTA 17% then 20 ml sodium hypochlorite 5.25% followed by 20 ml normal saline irrigation. The canals were dried with paper points. Canals were obturated using cold lateral compaction of gutta-percha (GAPADENT Co. LTD, China) and AH 26 sealer (Dentsply Tulsa). (Figure 4). (Figure 5, 6) is final radiography of root canal treatment. Cavit was used as a temporary filling material. Patient was referred to restorative department.

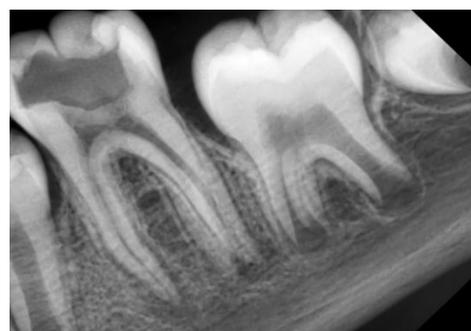


Figure 1 case 2

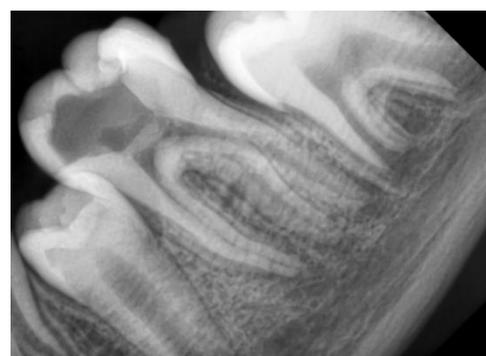


Figure 2 case 2

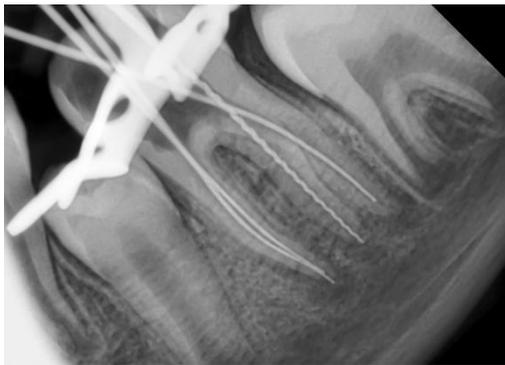


Figure 3 case 2



Figure 4 case 2



Figure 5 case 2



Figure 6 case 2

**Case report 3:**

A 30 years old male patient referred to Department of Endodontics with a chief complaint of (my tooth has hole) . The tooth was not tender to

percussion. There was no mobility and periodontal status was within normal limits. Pulp vitality testing of the involved teeth with cold (DENRONIC, Aero nova GmbH & Co. KG, Germany) and electric pulp stimulation (Parkel Electronics Division, Farmingdale, NY, USA) were negative, so the provisional diagnosis was necrosis with normal periapical status.

A diagnostic radiograph was taken which suggested deep caries with pulpal involvement and additional root [Fig 1] was noticed. Presence of additional root was confirmed by angled radiography. Local anesthesia was administered and the tooth was isolated with rubber dam. Access preparation was prepared .The first distal canal was found slightly away from the centre (buccally), and indicating that the other canal will be on the lingual side, the access cavity preparation was modified. The rest of procedure is the same as other cases. (Figure 2-4).

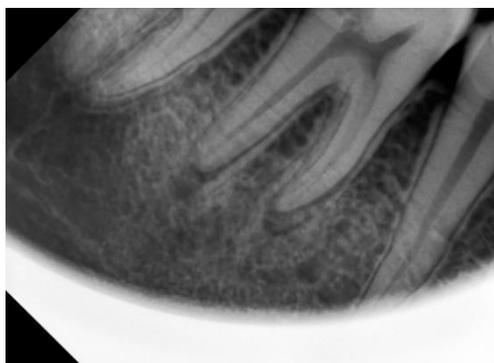


Figure 1 case 3



Figure 2 case 3



Figure 3 case 3



Figure 4 case 3



Figure 3 case 4

**Case report 4:**

A 23 years old male patient referred to Department of Endodontics with a chief complaint of (my tooth aches when I drink cold water). The tooth was not tender to percussion. There was no mobility and periodontal status was within normal limits. Pulp vitality testing of the involved teeth with cold (DENRONIC, Aero nova GmbH & Co. KG, Germany) and electric pulp stimulation (Parkel Electronics Division, Farmingdale, NY, USA) were positive, so the diagnosis was irreversible pulpitis with normal periapical status. A diagnostic radiograph was taken which suggested deep caries with pulpal involvement and additional root [Fig 1] was noticed. Presence of additional root was confirmed by object localization radiographic method. Local anesthesia was administered and the tooth was isolated under rubber dam. Access preparation was prepared. The rest of procedure is the same as other cases. (Figure 2-4)



Figure 4 case 4

**Case report 5:**

A 34 years old female patient referred to Department of Endodontics with a chief complaint of (my tooth aches). The tooth was not tender to percussion. There was no mobility and periodontal status was within normal limits. Pulp vitality testing of the involved teeth with cold (DENRONIC, Aero nova GmbH & Co. KG, Germany) and electric pulp stimulation (Parkel Electronics Division, Farmingdale, NY, USA) were positive, so the diagnosis was irreversible pulpitis with normal periapical status. A diagnostic radiograph was taken which suggested deep caries with pulpal involvement and additional root [Fig 1] was noticed. Presence of additional root was confirmed by object localization radiographic method. Local anesthesia was administered and the tooth was isolated under rubber dam. Access preparation was done. The rest of procedure is the same as other cases. (Figure 2-4)



Figure 1 case 4



Figure 3 case 4



Figure 1 case 5



Figure 2 case 5



Figure 1 case 6



Figure 3 case 5



Figure 2 case 6



Figure 4 case 5



Figure 3 case 6



Figure 4 case 6

#### Case report 6:

A 15 years old male patient referred to Department of Endodontics with a chief complaint of ( I cannot eat) . The tooth was tender to percussion. There was no mobility and periodontal status was within normal limits. Pulp vitality testing of the involved teeth with cold (DENRONIC, Aero nova GmbH & Co. KG, Germany) and electric pulp stimulation (Parkel Electronics Division, Farmingdale, NY, USA) were positive, so the diagnosis was irreversible pulpitis with acute periodontitis A diagnostic radiograph was taken which suggested deep caries with pulpal involvement and additional root [Fig 1] was noticed. Presence of additional root was confirmed by object localization radiographic method. Local anesthesia was administered and the tooth was isolated under rubber dam. Access was prepared . The rest of procedure is the same as other cases. (Figure 2-4)

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