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Prevalence of Radix Entomolaris in Mandibular First Molars of North Indian Population of Sunder Nagar, Himachal Pradesh

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Authors' contributions

This work was carried out in collaboration between all authors. Author SV has designed the study, wrote the protocol and wrote the first draft of the manuscript. Author PM did the statistical analysis and managed the analyses of the study. Author MS has managed the literature searches. All authors read and approved the final manuscript.

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Data Article

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ABSTRACT

Aim: The present study aimed to find the prevalence of Radix Entomolaris (RE) in North Indian population of Himachal Pradesh using periapical radiographs.
Methodology: The study was conducted at the Department of Conservative Dentistry and Endodontics; Himachal Dental College, Sundernagar, Himachal Pradesh. A total of 260 patients who visited the department for root canal treatment of mandibular first molars over the period of 2 years (May 2016-May 2018) were selected as the study sample. The patients had the bilateral presence of mandibular first molars. Out of these patients, 146 were females and 114 were of

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males. Hence, a total of 520 IOPAs of these patients were studied for the presence of additional root in mandibular first molars. The age of all the patients was between 18-65 (mean =36) years.
Results: Among all the studied radiographs; periapical radiographs of 24 patients showed an additional root. The prevalence of patients with three-rooted mandibular first molar was 9.23%; 9.59% for females and 8.77% for males. Out of 24 patients with RE; three patients had bilateral RE presentation (1.15%). There were 13 cases with left RE (5%) and 5 cases had right RE (3.08%).
Conclusion: The possibility of encountering RE in the Himachali population was noted in the present study. It should be detected properly and managed adequately.

Keywords: Mandibular first molar; radix entomolaris; himachali; periapical radiographs.

1. INTRODUCTION

The success of endodontic therapy lies in the ability of an endodontist in locating, debriding and obturating all the root canals of a tooth to their termination; thereby closing all the portals of exit and entry [1]. Failure at any stage results in post-treatment disease.

Apart from the two roots namely, mesial and distal of the mandibular first molar; there exists a supernumerary root which can be found lingually. This root, is called Radix Entomolaris (RE) [2] and was first mentioned in the literature by Carabelli.The third root of the permanent mandibular first molar has been described by various terms, such as distolingual root, additional or extra distolingual root and radix entomolaris [3,4].

An additional root at the mesiobuccal side is called the radix paramolaris. The identification and external morphology of these root complexes, containing a lingual or buccal supernumerary root, were described by Carlsen and Alexandersen [5,6].

Studies have reported that in populations with Mongoloid traits, such as Chinese, Eskimos, and American-Indians, it occurs with a frequency of 5 to more than 30% [7,8]. In the African population, a maximum frequency of 3% was found [9,10], whereas, in Europeans the incidence was even less [11]. In the North Indian population at Aligarh (Uttar Pradesh), Garg et al. examined 1054 periapical radiographs and reported 5.97% of occurrence of RE in mandibular first molars [12]. The same methodology was used by Karale et al. [13] who reported a higher incidence (6.67%) of RE.

Knowledge of both normal and abnormal anatomy of the molars dictates the parameters for execution of root canal therapy and can directly affect the probability of success. Therefore, practitioners must be familiar with all molar variations, as well as their prevalence in the Indian population. The Indian subcontinent is enriched with many diversities regarding topography, climatic conditions and ethnic origin of its population. To the best of our knowledge, no reports are available in the literature regarding the incidence of RE in the Himachali population of India. So, the present study aimed to find the prevalence of RE in North Indian populations of Himachal Pradesh using periapical radiographs.

2. METHODOLOGY

A total of 260 patients who visited the Department of Conservative Dentistry and Endodontics, Himachal Dental College, Sundernagar; Himachal Pradesh, India for root canal treatment of mandibular first molars over the period of 2 years were considered as the study sample. The patients had bilateral presence of mandibular first molar. Out of these patients, 146 were females and 114 were of males. Hence, a total of 520 IOPAs of these patients were studied for the presence of additional root in mandibular first molars. The age of all the patients was in between 18-65 (mean =36) years. All teeth included in the study had fully formed roots. This study was approved by the Ethics Committee of the Himachal Dental College, Sundernagar. Signed written consent forms were received from all the participants. Patients from other states and patients having permanent mandibular first molar on one side were excluded from the study.

The criteria used to indicate the presence of RE were clear distinction of an extra root, indicated by the crossing of translucent lines defining the pulp space and periodontal ligaments, originating in the upper half of the distal root.

All the radiographs were taken with bisecting angle technique from 20° to 30° (average 25°) mesial horizontal with −5° vertical angulation to

evaluate the presence of an additional root on Radiovisiograph (RVG) (Kodak Carestream Digital Radiography System RVG 6100).

Each radiograph was separately evaluated in the present study. In case of any disagreement, a joint evaluation of all the reports was made until a consensus was reached. The recorded factors were:

- Prevalence of Radix Entomolaris.
- Prevalence of Radix Paramolaris.
- Comparison of the occurrence between genders.
- Comparison between the two sides.
  The obtained data were analyzed by using the Pearson chi-square test with SPSS (15.0; SPSS Inc., Chicago, IL, USA).

3. RESULTS

Among all the studied radiographs; periapical radiographs of 24 patients showed an additional root; out of which 14 were females and 10 were males (Table 1). The prevalence of patients with three-rooted mandibular first molar was 9.23%; (24 out of 260); 9.59% for females and 8.77% for males (Table 1).

A total of 520 periapical radiographs of mandibular first molars comprising of 260 left and 260 right molars were evaluated. Out of 24 patients with RE; three patients had bilateral RE presentation (1.15%) (Fig. 4). There were 13 cases with left RE (5%) (Figs. 1 and 2) and 5 cases had right RE (3.08%) (Fig. 3) (Table 1). There was no significant statistical difference in the incidence of three-rooted mandibular first molars between male and female patients (*P>.05*). However, the occurrence of left RE was significantly higher than the right RE in mandibular first molars *(P< .05)*.

None of the case had radix paramolaris.

4. DISCUSSION

The identification of RE in mandibular molars greatly affect the execution and outcome of the treatment procedure. The present study used periapical radiographs to assess the prevalence of RE in the Himachali population. The radiographs taken at two horizontal angulations are the most easily available diagnostic tools to identify such anatomical anomalies of root canal system [14]. Computed tomography (CT) or cone beam CT might be a more beneficial tool in this respect, but considering the added radiation and cost, periapical radiography seems to be a satisfactory tool [15]. The accurate diagnosis of RE is compulsory. RE predisposes mandibular first molars to periodontal destruction [16]. The studies have reported increased probing depths on the distolingual aspects of three rooted mandibular molars.

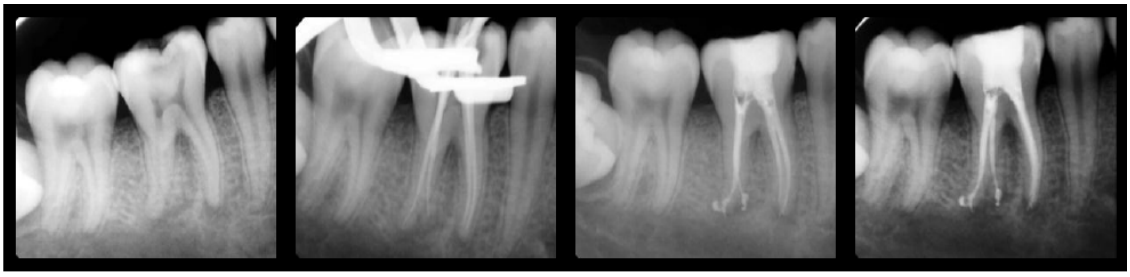

Fig. 1. Endodontic therapy of a male patient with RE in the left mandibular first molar

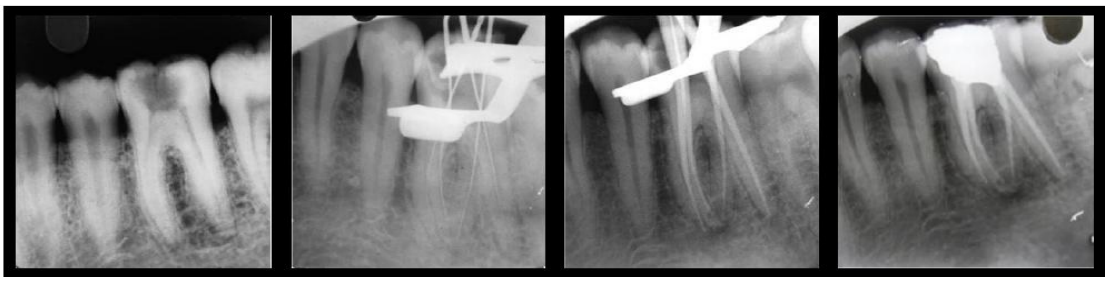

Fig. 2. Endodontic therapy of female patient with RE in the left mandibular first molar

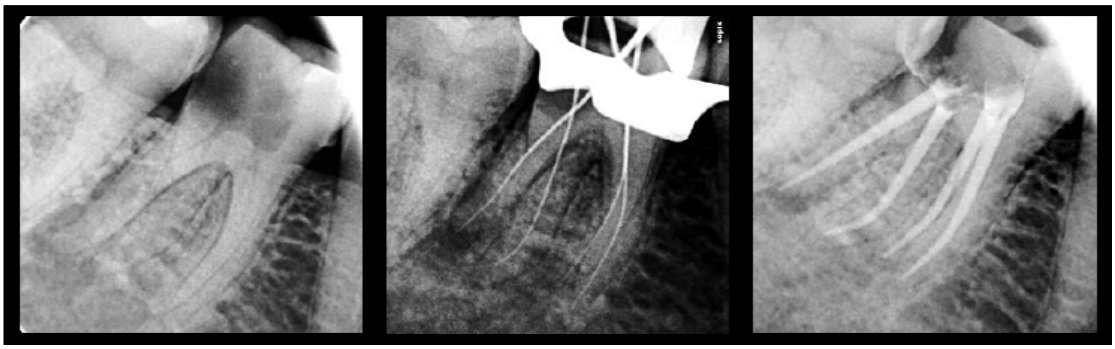

Fig. 3. Endodontic therapy of female patient with RE in the right mandibular first molar

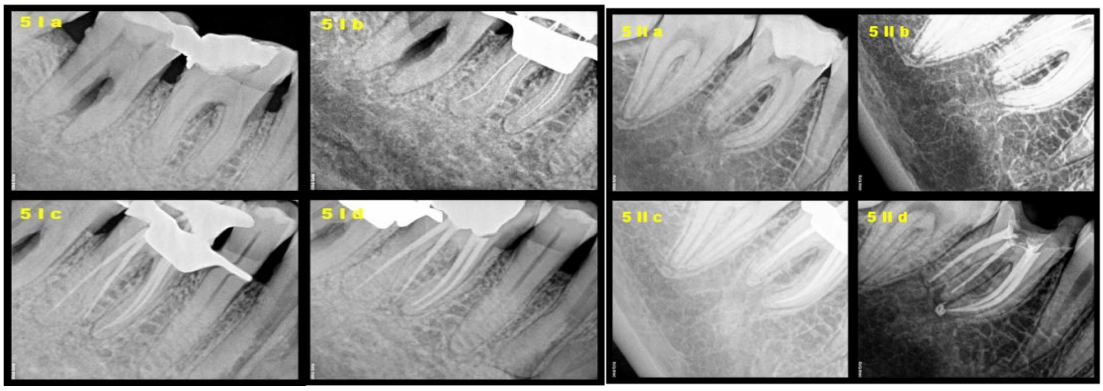

Fig. 4. A patient presenting with bilateral RE in the left mandibular (image 5Ia-5Id) and right mandibular first molar (5IIa-5IId)

Table 1. Description of all the data collected in the study

Number of three rooted mandibular first molars									
Number of patients and radiographs		**Right molars**		**Left molars**		**Bilateral**		**Total**	
		n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Total patients	260	8	3.08	13	5.00	3	1.15	24	9.23
Female	146	5	3.42	7	4.79	2	1.37	14	9.59
Male	114	3	2.63	6	5.26	1	.88	10	8.77
Number of all right first molars examined	260	8	3.08	-	-	3	1.15	11	4.23
Number of all left first molars examined	260	-	-	13	5.00	3	1.15	16	6.15
Total	520	8	1.54	13	2.5	6	1.15	27	5.19

The studies largely vary in reporting the incidence of RE in various population groups. This could be greatly attributed to the variations in sample size and methods of RE identification. In the present study, the overall prevalence of RE was 9.23%; this is relatively higher than the other studies conducted on Indian population groups [17,18,19,20,21]. It was observed that three patients had bilateral RE presentation (1.15%), 13 cases had left RE (5%) and 5 cases had right RE (3.08%). The occurrence of RE was higher on the left side. This finding is in accordance with the previous studies [8,11].

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 defines to an initially curved entrance which continues as a straight root/root canal. Type III classifies 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.

The presence of RE when confirmed by preoperative radiographs, a modification of classic triangular opening cavity to a trapezoidal form is required to locate and access the root canal system in a better way [4]. A severe root inclination or canal curvature, particularly in the apical third of the root (as in a type III RE), can cause shaping aberrations such as straightening of the root canal or a ledge, with root canal rotary files, which allows a more centered preparation shape with restricted enlargement of the coronal canal third and orifice relocation. An angled view of IOPA should always be taken in case of any doubt.

The present study affirm strong relationship between ethnic origin of a population and the prevalence of RE. The radiographs continue to be the indispensable tool and seem to be quite reliable in detecting the presence of RE. However, there are known limitations which include anatomical noise, two-dimensional images, and geometric distortion. CBCT overcomes these drawbacks by reducing superimposition and permitting better view of three-dimensional structures [22].

5. CONCLUSION

The habit of careful clinical and radiographic examination should be practiced, lest we miss the anatomic variations of the root canal. The prevalence of Radix Entomolaris in the Himachali population seems to be high and should be kept in mind for any future study.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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