

PREVALENCE OF THREE ROOTED MANDIBULAR FIRST MOLARS IN EGYPTIAN POPULATION: CROSS-SECTIONAL STUDY

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ABSTRACT

Purpose: of this cross-sectional study was to determine the proportion of permanent mandibular first molar teeth with three roots among the Egyptian population.

Material and methods: In total, 479 digital periapical radiographs were screened & evaluated to get 312 samples for the study. The 312 studied subject, 137 male and 175 females, aged range from 19 to 70 years. Symmetry, gender, and frequency of existence of third root in mandibular first molars were assessed and analyzed using chi square test. Two examiner evaluated the radiographic characteristics of the radix entomolaris (RE). Cohen kappa test was used to assess intraexaminer variability.

Results: The prevalence of RE was 2.91 % (4/10) in male, 3.42% (6/10) in female. Total Prevalence of RE in mandibular first molar was 3.12 %. There was no significant difference regarding to gender as $p = 0.862$. The Prevalence RE showed no statistically significant regarding to the position either unilateral or Bilateral ($p=0.342$)

Conclusion: The overall prevalence of the RE is 3.12% in the mandibular first in the Egyptian population.

KEY WORDS: radix entomolaris, RE, three-rooted mandibular first molars, Egyptian population.

INTRODUCTION

The main objective of root canal treatment is to reduce microorganisms and their byproduct from the root canal as well as to prevent reinfection and three dimensionally seal the root canal system.

The detection of morphological and anatomical variations in root canal systems improves the success and outcome of canal therapy. Failure to identify anatomical and morphological abnormalities in roots and canals, such as extra roots or canals, can have detrimental impacts extending from teeth with

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poor prognosis to chronic periapical lesions that do not respond to therapy, and may even result in tooth loss. Therefore, proper awareness of the prevalence of uncommon root canal anatomy is crucial for effective root canal therapy ⁽¹⁾.

The occurrence of a distolingual root called radix entomolaris (RE), initially identified by Carabelli, as a variant in the mandibular first molar⁽¹⁻⁴⁾. Morphological researches have provided a correlation between the occurrence of a distinct RE in the first mandibular molar and specific ethnic groupings. It occurs at a frequency of 5 to over than 30% among groups having Mongoloid characteristics, such as American Indians, Eskimos, and Chinese ^(5,6). A prevalence of 3% was reported in the African population, whereas the prevalence was considerably lower in the European population ^(7,8).

Although this finding reveals that the development of the RE may be associated to the recessive disorders of an atavistic gene, the explanation of this trait remains unknown. External influences during odontogenesis, in addition to genetic and environmental factors, may potentially be responsible for supernumerary roots ^(4,9). Aside from the recognised endodontic complications associated with missed canals, an extra root might even be a factor conducive to localised periodontal obliteration since increased probing depths and attachment loss have been described at distolingual positions of mandibular first molars with three roots⁽¹⁰⁾.

The prevalence of any tooth anatomical variation is crucial to understand, since it plays a key role in clinical dentistry. However, data on the prevalence of RE in the Egyptian population is limited. The goal of this study was to determine the proportion of permanent mandibular first molar teeth with three roots in the Egyptian population by utilising conventional digital X-rays and cone-beam computed tomographic images on RE cases.

MATERIALS AND METHODS

Sample size calculation

The present study's sample size was determined using the results of a previous publication that measure the prevalence of RE in African & Arab population and used similar method ^(11,12). At a power of 80% and an alpha-type error of 0.05, the sample size was 312 (effect size of 0.03), with the formulation $n = (Z_{1-\alpha/2}^2 p(1-p)/d^2)$ ($p= 0.037$, $Z_{1-\alpha/2} = 2.32$, $d = 0.03$) ⁽¹³⁾. The conventional digital X-rays images of the patients match the inclusion/exclusion criteria were randomly chosen using the random number table.

Selection of the samples

This epidemiological cross-sectional study was performed in Al Azhar university faculty of Dental Medicine. The protocol was accepted by the Research Ethic Committee (REC) of Al-Azhar University's Faculty of Dental Medicine for Girls with Code (P-PD-21-10) and conducted in accordance with guidelines.

This study's population consisted of a sample of outpatients from faculty of Al Azhar university faculty of Dental Medicine who attended into clinic between 2016 to 2020. Faculty of Dental Medicine receives a variety of patients from Cairo and surrounding governorates. Digital periapical X-rays were not obtained with the intention of being used in this research; rather, present data from our clinic that was collected for diagnostic purposes or endodontic therapy. Only patients that meet the following inclusion criteria: Egyptian nationality; radiographs verifying the existence of permanent lower first molar; and complete root maturation were deemed for further investigation.

Patients with radiographs that are unclear or don't show the complete tooth were excluded from the study. The patient's gender and age were all recorded. The following criteria utilized to

determine the existence of RE were as follows: visible demarcation of third root, revealed by the crossing of translucent lines denoting the pulp space and periodontal ligaments, beginning in the upper half of the distal root. Digital periapical X-rays of 312 patients from 137 male & 175 females were screened. In total, 642 radiographs were evaluated from Department of Oral and Maxillofacial Radiology & endodontic database. Using a random number table, the sample size (312) were determined from 497 digital periapical radiographs that met the inclusion requirements.

Radiographic Assessment

Radiographic assessment included periapical radiographs, which showed the full image of mandibular first molar. The radiographic images were accessible in a digital image radiographic system; (vista scan software, DBS-WIN program) and analyzed one by one on a 19 inch - display monitor. The images were evaluated by one oral radiologist and one endodontist. Inter examiner reliability were tested before conducting the study by screening 30 digital periapical radiograph with the same inclusion criteria to identify the presence of RE. The kappa test values were 0.86 for intra examiner reliability. After calibration any disagreement in evaluation were solved by consensus.

The presence of RE were further investigated using CBCT images aplanmecapromax 3D mid machine (Asentajankatu 6 FIN00880 Helsinki,

Finland). The Digital Image Communication in Medicine (DICOM) Romexis viewer (4.5.0.R) software was used to analyze the image sections (figure 1).

The occurrence of RE in mandibular first molars, and the gender ratio of these teeth, were investigated. The frequency of bilateral and unilateral presence of such teeth, as well as the comparing of right to left side frequency of RE, were also calculated.

Statistical analysis

All collected data tested by Stata Statistical Software: Release 17.0 (College Station, TX: StataCorp LLC). For evaluating differences with categorical data, the chi-square test & Fisher's exact test were utilised. A level of significance was set at P value < 0.05.

RESULTS

The 312 studied subject, 137 males and 175 females, aged range from 19 to 70 years were eligible for analysis from total 497. The prevalence of RE was 2.91 % (4/10) in male, 3.42% (6/10) in female. Total Prevalence of RE in mandibular first molars was 3.12 %. There was no significant difference regarding to gender as $p = 0.862$ (Table 1). The Prevalence RE showed no statistically significant regarding to the position either unilateral or Bilateral ($p=0.342$), as 1.92 % recorded bilateral, 0.32% left side and 0.96% right side. Furthermore there was no significant difference recording to frequency of RE right or left side .

TABLE (I). Results displaying number (N) and percentage (%) of RE in permanent mandibular first molars.

	Number of Patients	Right		Left		Bilateral		Total	
		N	%	N	%	N	%	N	%
Male	137	1	0.72	1	0.72	2	1.45	4	2.91
Female	175	2	1.14	0	0	4	2.28	6	3.42
Total	312	3	0.96	1	0.32	6	1.92	10	3.12
P value		0.435		0.547		0.342		0.862	

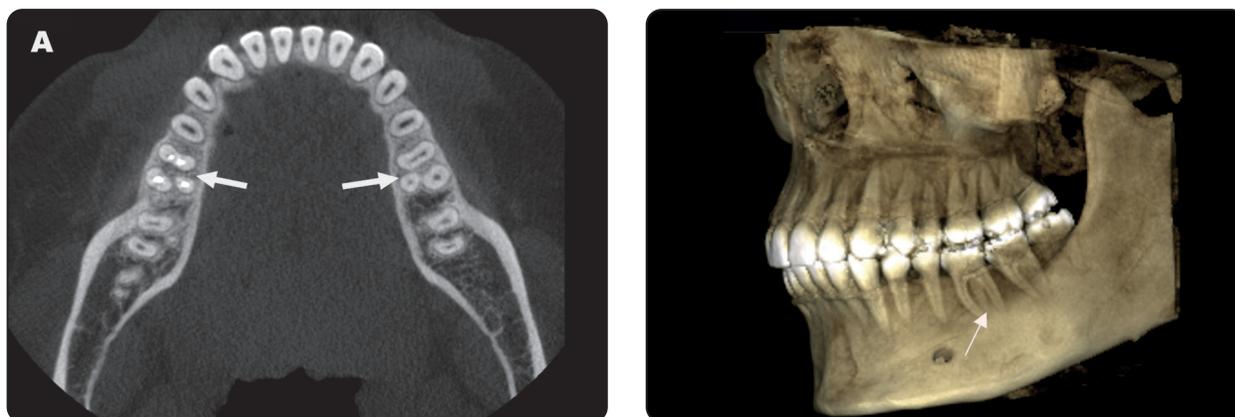


Fig. (1) : Cone beam computed tomographic image: (a) axial section of CBCT image showing bilateral distribution of RE in lower first molar.(b) Skull orientation from lateral view (white arrow) denoting RE.

DISCUSSION

Variation in root canal morphology is one of the most common dilemmas that affect endodontic treatment outcome. Knowledge of this variation by clinician increases success rate therefore, every clinician should be familiar with abnormal variation and its prevalence among population. Distolingual root or radix entomolaris RE Considered as one of the most common genetic racial trait in mandibular molars⁽¹⁴⁾

Digital periapical radiographs have been chosen for the current study as they are regularly used as a base for collecting diagnostic information⁽¹⁵⁾. Moreover, reduction in radiation than conventional radiograph, inexpensive, noninvasive technique and examiners can digitally manipulate the images for comparing anatomical variation of mandibular first molar regarding to gender and bilateral prevalence. Despite this advantages this method encounters some limitation. Super imposition of distobuccal root and RE as they mainly positioned in the same bucco lingual Plane^(4,11). A most recent technology which provide 3-D radiographic image was cone beam computed tomography CBCT. It has a superior image quality in relation to conventional digital radiograph and give an accurate measurement for direction of the curvature of RE and position

of its canal opening in relation to other canals in mandibular first molar for anatomical analysis⁽¹⁶⁻¹⁹⁾. Hence digital periapical radiographs were used for initial monitoring of the existence of RE & CBCT were used for confirmation and detecting a variation in the position of RE.

Variation in the prevalence of RE among the populations mainly regarding to different ethnical background. Limited numbers of previous studies estimate the prevalence of RE among Arab population. As the prevalence were 3% in Sudanese, 2.9% in Saudi Arabian population, 3.052% in Yemeni population and 3.73% in Palestinian population^(7,11,12,20). This finding were in accordance with the result of current study which reported 3.12% for the prevalence of RE. However, Latest global cross sectional research with meta-analysis reported 5.6% prevalence of RE with range (0.9- 22.4) % in many countries including Egypt. High Reported finding of this study is attributed to presence of china which reported 22.4 % prevalence. Superiority of Asian populations including Chinese, Koreans, and Taiwanese (29.3, 25.8, 25.3) % respectively in regarding to the prevalence of RE are reported in the literature^(19,21,22). Meanwhile in the Middle East, Jordanian reported 4%, Turkish 0.5% and Iranian 3.1% prevalence⁽²³⁻²⁵⁾. This range is in accordance with the result of the current study.

The prevalence of RE was higher in female 3.42% than in male 2.91% but with no significance difference which in accordance with other studies (20,8). In concurrency to previous studies in the literature which reported significant difference Regarding to gender (26). There was no significant difference regarding to position of RE either bilateral position or unilateral. This observation is consistent with the findings of earlier studies that reported 50- 69 % bilateral prevalence of RE. Controversy is present in the literature as some studies directed toward right side prevalence while few others reported left side prevalence (27-30) Variation in this result is may be attributed to sample size, population recruitment, and evaluation method. RE as an anatomical variation affect endodontic and periodontal treatment outcome (10,26)

CONCLUSION

The prevalence of the RE is 3.12% in the mandibular first molar among Egyptian population.

RECOMMENDATIONS

Detailed assessment of radiographs taken from various angles is needed to increase the likelihood of detecting anatomical variations as RE and lowering the risk of missing canals. Additionally, CBCT is advised in patients assumed of having an additional third root.

CONFLICT OF INTEREST

The authors disclaim any conflicts of interest in connection with this work.

FUNDING

No funding was obtained for this study.

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