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RESEARCH ARTICLE

Prevalence of Third Root in the Permanent Lower First Molar (*in vivo* study)

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Abstract:

Introduction:

Successful endodontic treatment requires complete information about the morphology of the tooth's root canals. Our research aims to assess the prevalence of a third root in permanent mandibular first molars among Iraqi people.

Methods:

Two hundred fifty-seven patients (161 females and 96 males) were involved. All patients required endodontic treatment of the permanent mandibular first molar. Regular teeth examinations were performed by two experienced Endodontists over a period of 18 months. Digital radiography and CBCT were used to investigate the presence of radix entomolaris (RE). The prevalence of a third root between males and females was compared. Statistical evaluation of the data obtained was conducted using a chi-square test with SPSS version 20, $P \leq 0.05$ indicates a significant difference.

Results:

The total prevalence of RE was five teeth among 257 patients or 1.9%. Statistical analysis revealed a non significant difference ($P > 0.05$) in the prevalence of a third root between females (2/161) and males (3/96) (1.2% and 3.1% respectively).

Conclusion:

Third roots in mandibular first molars among Iraqi people are not rare; therefore endodontists should keep attention to detect such morphological variations when performing endodontic treatment.

Keywords: Digital radiograph, Distolingual root, Endodontic treatment, Radix entomolaris, Mandibular first molar, Morphology.

Article History

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1. INTRODUCTION

Scientific knowledge of the morphology of the teeth roots and their canals plays an important role during endodontic treatment. This will ensure complete debridement of all infected pulp with complete instrumentation and obturation [1]. A periapical lesion may result from failed endodontic treatment if any one of the above procedures is performed inadequately [2]. Generally, two roots found in permanent mandibular first molars have two roots: one root mesially and one root distally. Two root canals are present in the mesial root (the mesiobuccal and the mesiolingual). Typically, One canal is present in the

root distally, but may sometimes present a second canal. The presence of a distolingual root in the mandibular first molar is considered the main variant of this tooth, named radix entomolaris (RE) and its occurrence is infrequent. Several anatomical surveys established a racial origin for the occurrence of a third distolingual root in the permanent mandibular first molar. It presents a prevalence of 5% to more than 30% in populations with Mongoloid traits, such as Chinese, Eskimos, and American-Indians [3, 4]. A maximum rate of 3% is observed in the African population [5, 6], while its prevalence in Europeans is lower. Clinically, it is of great importance to provide sufficient information about the morphological variation of any tooth that can affect the success rate of root canal therapy. Our research aims to determine the prevalence of a distolingual root in the permanent lower first molar among Iraqi people.

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2. MATERIALS AND METHODS

Two hundred fifty-seven patients aged 20-45 years old (161 females and 96 males) were included in this study. This research was performed in accordance with the Helsinki Declaration and approved by the Ethical Approval Committee at the University of Anbar (No.83). Patients attained a private dental clinic for endodontic treatment included in this study after taking written consent from all patients. Regular teeth examinations were performed by two experienced Endodontists over a period of 18 months. Two preoperative radiographs were taken for each patient with a digital X-ray sensor (Visiodent RVG Dental Sensor, France) using 30° mesial angulation of the X-ray cone. All radiographs were fixed on X-ray screens and evaluated by two investigators. Viewing translucent lines around the pulp and the periodontium of the superior part of the distal root considered signs of RE (Fig. 1). (CBCT) was used to assess the anatomy and curvature of the root canal to approve the presence of the additional root (Fig. 2). The images obtained *via* CBCT were also evaluated by two independent observers to improve the accuracy of the readings. The presence of a third root among males and females was statistically evaluated using chi-square test with SPSS version 20 (IBM, Chicago). Statistically significant difference present at a value of $P \leq 0.05$.

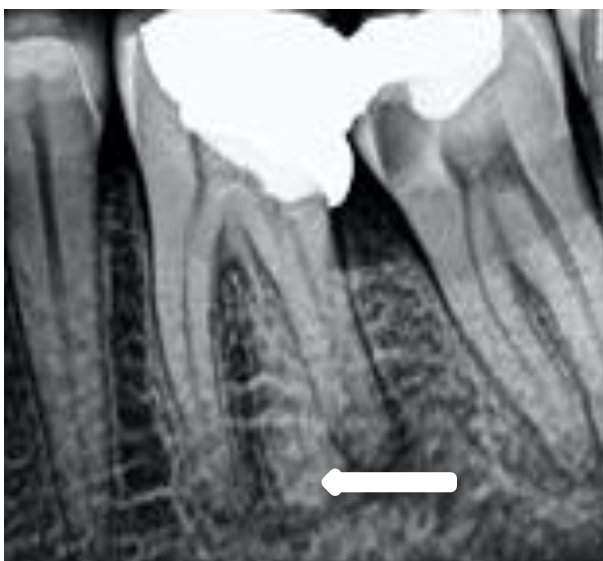


Fig. (1). Preoperative radiograph.

3. RESULTS

The total prevalence of RE was five teeth among 257 patients, corresponding to percentage of 1.9%. Statistical analysis revealed a nonsignificant difference ($P > 0.05$) in the prevalence of a third root between females (2/161) and males (3/96), as shown in Table 1.

4. DISCUSSION

The first permanent teeth to erupt are the mandibular first molars. These teeth present a high incidence of tooth decay and often require root canal treatment. Missed canals with the subsequent incomplete instrumentation of all infected pulp is

one of the most common reasons for unsuccessful endodontic treatment. Full knowledge of morphological root variations substantially increases the chance of a successful root canal treatment. Leaving the third (distolingual) root canal untreated drastically reduces the chance of successful treatment. RE has been classified into the following: type I when root or canal is straight; in type II, the root/root canal is curved at its entry and continues straight; in type III, the entry is curved and another curve is present in the middle, continuing [7]. Requirement of successful endodontic treatment is the preoperative radiograph with a correct examination of the tooth clinically [8]. A thorough information about the presence of additional root or root canals can be conducted by taking radiographs at various angles [7]. Alteration of the tooth form coronally, like a highly clear distolingual lobe with a convex cervical outline, constitutes a clinical indication of a third root [9]. Many studies have stated that taking two radiographs with a mesial or distal shifting cone (30°) is very helpful for investigating the occurrence of RE [10 - 12]. Rectangular or trapezoidal outline access cavity preparation should be performed when a third root is established or suspected radiographically. The location of third root orifice is distolingually to mesiolingually in relation to major distal canal. If the access to the third root is not after the roof of the pulp chamber is removed, clinicians must use a sharp endodontic explorer along the distolingual wall and floor corner of the pulp chamber to detect the third root canal [9].



Fig. (2). CBCT (Sagittal view).

Table 1. Percentage of radix entomolaris in the tested patients.

P-value	Number of Radix Entomolaris (%)	Number of Females	Number of Radix Entomolaris (%)	Number of Males
0.07	2 (1.2%)	161	3 (3.1%)	96
Total (5/257) (1.9%)				

In the current study, the percentage of third root prevalence in mandibular first molars is 1.9%. This result is consistent with values obtained in other investigations involving Middle

East people [10 - 13]. In comparison with data from other studies conducted with patient of Asian origin, our result is lower. These studies reported the prevalence of a third root as follows: 4.5% in Koreans [14], 32% in Chinese [15], and 25.6% in Taiwanese [16]. In addition, our results showed a nonsignificant difference in the occurrence of RE between males and females. Other studies have achieved similar results [17 - 20]. Previous *in vivo* study was accomplished by Mukhaimer and Azizi who studied the incidence of RE in Palestinian people who attended a dental centre for endodontic treatment. The total percentage of third root incidence in mandibular first molars was 3.73%; this is considered within the range of other studies conducted among the Middle Eastern population, although it is significantly lower than the range obtained for population of Far East [21]. Whenever the additional root is suspected to be present during endodontic treatment of permanent mandibular first molar, modification of the access cavity preparation should be performed in order to ensure complete cleaning and obturation of all root canals, otherwise the presence of missed canal can result in failure of the treatment.

CONCLUSION AND RECOMMENDATION

A Third root was identified in 1.9% of Iraqi patients during an examination of permanent mandibular first molars. Consequently, endodontists should investigate whether the patient presents this morphological variation of the root canal system before performing a root canal treatment.

LIST OF ABBREVIATIONS

RE = Radix Entomolaris
CBCT = Cone-beam Computed Tomography

AUTHORS' CONTRIBUTIONS

All authors participated sufficiently in this work to have a public responsibility for its contents. All authors were involved in the study's conception and design, the analysis and interpretation of the data, conscripting the writing article and critical revisioning of the article, and its final approval. All authors agree to be accountable for all aspects of the work and to ensure that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. NAH created the concept and design of the study, FAR conducted the research, OHA collected, organized data, analysed and interpreted data, HAS wrote the initial and final drafts of the manuscript. All authors have critically reviewed and approved the final draft and agreed on their shared responsibility for the contents and the similarity index of this manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This research was approved by the Ethical Approval Committee at the University of Anbar (No.83).

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were in

accordance with the ethical standards of institutional and/or research committee and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from all participants.

AVAILABILITY OF DATA AND MATERIALS

All the data and supportive information are provided within the article.

STANDARDS OF REPORTING

STROBE guidelines were followed in this study.

FUNDING

None

CONFLICT OF INTEREST

The authors declare no conflict of interest financial or otherwise.

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Declared none.

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