

## ORIGINAL ARTICLE

# PREVALENCE OF RADIX-ENTOMOLARIS IN THE PERMANENT MANDIBULAR FIRST MOLAR AMONG SAUDI SUB-POPULATION

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## ABSTRACT

**Objective:** To estimate the prevalence of radix entomolaris (RE) in the permanent mandibular first molars in Saudi Sub-population. **Materials & Methods:** A total of 2154 radiographs were selected and interpreted by two independent interns for the presence of extra root (RE). 154 radiographs were excluded and 2000 peri-apical radiographs were selected to represent the study sample. Data were analyzed and the prevalence of the RE was then calculated. **Results:** Only 144 cases were diagnosis with an RE. The prevalence of RE among Saudi subpopulation who visited the college of dentistry, King Khalid University was 7.2 %. This was evenly distributed in the right (74 cases) and left (70cases) sides, and between males and females with 76 & 68 cases, respectively. **Conclusion:** The prevalence of RE in Saudi subpopulation was 7.2 %, which is comparable to others except for mongoloid peoples. Initial diagnosis is essential to avoid 'missed canals' and improper treatment planning. Dental practitioners should be able to identify morphologic abnormalities in the permanent mandibular molars to achieve successful and satisfactory endodontic treatment outcome.

**Keywords:** Permanent Molars, Prevalence, Radix-Entomolaris, Sub-population

## INTRODUCTION

For achieving a clinically successful outcome in endodontics, it is crucial for clinicians to have a complete understanding of the root canal system complexity, especially with respect to the molars. The permanent mandibular first molar usually has two separated roots, namely, the mesial root with two canals and the distal root with one canal.<sup>1</sup> The mesial canals tend to merge together at a foramen. Typically

there is a single distal canal; however, a second distal canal may occasionally form in the same root.<sup>2</sup> Such a tooth can display several anatomical variations with respect to the number of canals or roots.<sup>3</sup> The awareness and prediction of unusual root canal shape and configuration during case selection can help improve the outcome of endodontic treatment.<sup>4</sup>

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In some occasions, an additional root can be seen in the mandibular first molar. It is called radix paramolaris when formed on the mesiobuccal side of the tooth and radix entomolaris (RE) when formed in the distolingual aspect.<sup>3,5-6</sup> To achieve a straight-line access in the presence of an RE in the mandibular molars, a modified access cavity is needed with more distolingual extension and a more rectangular or trapezoidal outline form.<sup>7</sup>

The presence of a separated RE is reported to be associated with some ethnic subpopulations.<sup>4</sup> The incidence of RE is < 5% in Caucasians,<sup>8</sup> Africans,<sup>9</sup> Eurasian and Indian<sup>10</sup> subpopulations. However, Mongoloid subpopulations, including Eskimos and Chinese, have a reportedly higher frequency of 30 to 30% of the presence of an RE.<sup>11-13</sup> In such populations, RE is considered a normal morphology of the mandibular first molars.<sup>8</sup>

To clearly observe an RE during radiographic evaluation, an additional radiograph from a different mesial or distal angle must be taken.<sup>14</sup> However, a major limitation of the conventional radiography lies in the two dimensional restricted view, which increase the superimposition of the overlying structures, thereby leading to difficulty in interpretation.<sup>15</sup> In contrast, cone beam computed tomography (CBCT) is a reconstructed three-dimensional imaging technique indicated for complex cases with unusual anatomy, which helps in accurate diagnosis and detection of the extra root.<sup>16</sup>

The main objective of this study was to estimate the prevalence of RE in permanent mandibular first molars in Saudi Sub-population.

## MATERIALS & METHODS

This study was conducted at the College of Dentistry, King Khalid University (KKU), Abha, Saudi Arabia. The study received IRB approval # [SRC/ETH/2018-19/023]. The patients data were collected from the Department of Diagnostic Science College of Dentistry at KKU. All

radiographs from January 2016 to June 2018 were examined and included in the study. A total of 2154 radiographs of the mandibular molars taken at different angles were considered for the study. Selected mandibular first molars should have at least 2 peri-apical radiographs taken at different angulation with clearly distinguished RE.

All the radiographs were interpreted by two independent interns and confirmed for the presence of an extra root by an endodontist. Inter- and intra-examiner reliability were checked in 25 random radiographs, which revealed a Kappa value of 0.82 indicating substantial agreement between the examiners. A total of 154 radiographs were excluded owing to absence of consensus between the evaluators. Consequently, a total of 2000 peri-apical radiographs (1000 females & 1000 males) were selected to represent the study sample. Subsequently, the data were entered in an MS Excel sheet for the evaluation of the RE, wherein frequency and percentage calculations were performed. The data were further analyzed using SPSS version 17 statistical software (IBM Statistics Inc., Chicago, USA), and the level of significance was set at 5%. Finally, the prevalence of RE was calculated.

## RESULTS

Two clear radiographs of the mandibular first molars from different horizontal angles were found in only 15% of all the patients as per the database. Among the 2000 periapical radiographs, only 144 cases were clearly detected with the RE, that, is an extra third root in the distolingual area of the tooth. Hence, the prevalence of RE among the Saudi subpopulation, who visited the college of dentistry, KKU was 7.2 %.

RE was evenly distributed on both the right (74 cases) and the left (70 cases) sides. Moreover, prevalence of the RE was comparable between males and females, with 76 and 68 cases, respectively. Among all the cases, only 83 cases had undergone root canal therapy by postgraduates and specialists in the clinics at the college of dentistry at KKU (Table 1).

**Table 1:** Distribution of radix entomolaris among Saudi sub-population

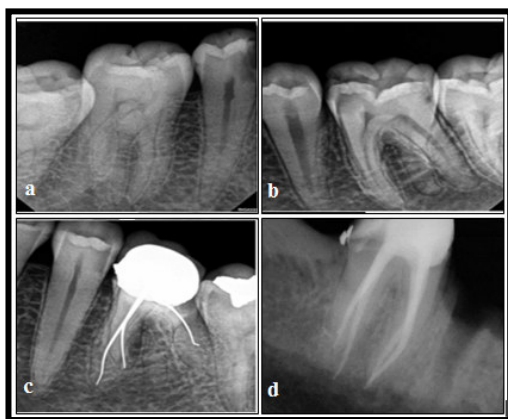
<i>Gender</i>	<i>Tooth</i>	<i>Radix (%)</i>	<i>Normal (%)</i>	<i>Total</i>
<i>Male</i>	<i>Right</i>	38 (7.5)	469 (92.5)	507
	<i>Left</i>	38 (7.7)	455 (92.3)	493
<i>Female</i>	<i>Right</i>	36 (6.9)	485 (93.1)	521
	<i>Left</i>	32 (6.7)	447 (93.3)	479
<i>Total</i>		144 (7.2)	1856 (92.8)	2000

## DISCUSSION

As per previous reports RE believed to be associated with certain ethnic populations. In our study, the frequency of RE in the Saudis was 7.2%. This is slightly higher than the reported frequency of 5% in the Caucasians, Africans, Eurasians and Indians. Presence of an RE is considered as unusual anatomic variation in such populations.<sup>8-10</sup> On the contrary, the frequency of RE in Saudis is much lower than that reported for the Mongoloid subpopulations( 7.2% compared to >30%), such as Eskimos and Chinese.<sup>11-13</sup> The high frequency in such populations is considered as a normal morphology in relation to the mandibular first molars. However, the prevalence of RE in the Saudi subpopulation is very low and nearly equal to that of the Caucasian, African, Eurasian, and Indian populations. Thus, it is considered as an abnormal

variation that requires more attention during diagnosis and treatment.

The etiology of RE is unclear; however, certain racial and genetic factors have been found to be responsible for expressing some RE-specific genes. These genes are believed to be responsible for such a phenotypic manifestation.<sup>17,18</sup> Although RE can be found in all mandibular molars (1st, 2nd and 3rd), the frequency is lower in the second and the third molars as shown in (Figure 1d).<sup>19</sup> Bilateral occurrence of RE have been found to be 67% as reported in some studies.<sup>12,20</sup> This suggests the need for careful clinical and radiographic inspection in people diagnosed with RE on either side (Figure2).



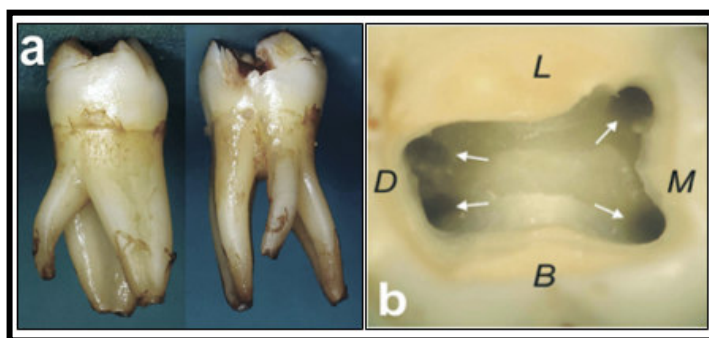
**Figure 1:** Radiographic pictures of lower molars exhibiting RE. (a,b) Pre-operative radiograph. (c) Missing disto-lingual canal in a tooth diagnosed as RE. (d) Second molar diagnosed with RE.



**Figure 2:** Radiographic pictures of lower first molars exhibiting RE. (a1,a2) Pre-operative radiographs. (b1,b2) Post-operative radiographs. (b2) showing procedural error due to severe distobuccal curvature.

In RE, the third root is located distolingually and may present as a fully mature root or as a small, short, conical-shaped root. It can also be completely separated, as seen in most of the cases, or partially fixed with the main distal root (Figure 3a). Clarsen and Alexandersen<sup>6</sup> in 1991 classified RE into 4 different types, according to curvature location in the cervical part. The cervical curvature is located distally in type A and B, whereas, in type C, it is

located mesially. In type AC, the root is located more centrally between the main roots. RE tends to have a severe curvature at the apical one third.<sup>21</sup> Clinically, this poses a great challenge during canal debridement, and may lead to instrument separation or a procedural error, such as transportation, stripping, perforation, or zipping of the apical one third (Figure 2b2).



**Figure 3:** Photographs of a mandibular first molar with RE. (a) distal view left & lingual view right, (b) occlusal view through access cavity with modified access shape (Reprinted from Calberson et al.<sup>4</sup>)

Thus, dental practitioners should be able to identify abnormalities in tooth or root morphology in permanent mandibular molars to achieve a successful and satisfactory endodontic treatment outcome. The presence of an RE makes the endodontic treatment more difficult for such a tooth. A correct initial diagnosis of an RE is crucial for proper endodontic treatment to not miss the extra root during the endodontic treatment (Figure 1c). Since the additional root (RE) is located lingually, it lies in the same direction as the X-ray beam and can be easily missed during radiographic interpretation. Thus, its presence should be confirmed with another radiograph from a different horizontal angle.<sup>14,16</sup> A clinician should always suspect an RE when the distal root contour is not clearly seen in the radiographs (Figure 2a1, a2).<sup>4</sup> A correct clinical diagnosis can be achieved by using two conventional radiographs obtained from different horizontal angles. However, CBCT may be indicated in complex and confusing cases.

The orifice location of the distolingual canal in an RE has some implication on the shape and extension of the access cavity. Thus, the shape must be modified to ensure a straight-line access (Figure 3b) and locate all the orifices to prevent instrument

separation in the severely curved apical one third. The importance of the use of dental operating microscope or dental loupes should not be underestimated for detecting canal orifice.

## CONCLUSION

The prevalence of RE in the Saudi subpopulation was 7.2 %, which is comparable to that in the Caucasians, Africans, Eurasian, and Indians, but not to the prevalence in the mongoloid subpopulations. Initial diagnosis based on correctly taken radiographs is essential to not miss the additional root for proper treatment planning. Moreover, the shape of the access cavity should be modified to ensure a straight-line access, thereby decreasing the chances of errors during the treatment.

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