

Prevalence And Morphological Study Of Three Rooted Mandibular First Molar [Radix Molar] In Indian Population

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Citation

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Abstract

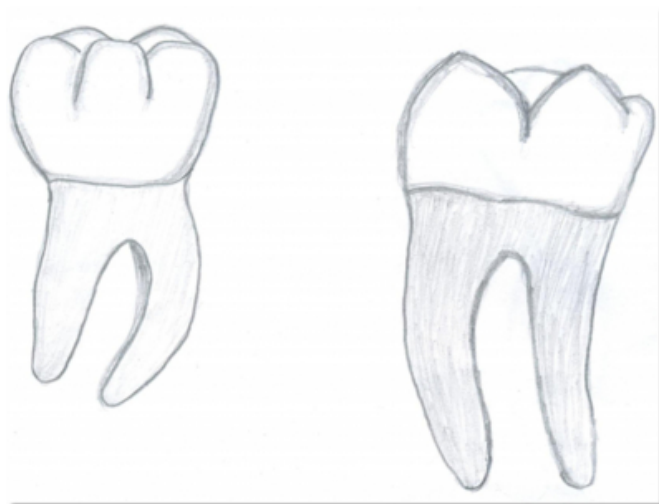
The purpose of this study was to evaluate the incidence of three rooted mandibular first molar among Indian population. A total of 1000 patients were screened with the help of orthopantomogram and two periapical radiographs taken from two different horizontal angles; out of these, 550 patients having both side mandibular first molar were selected. The incidence of three rooted mandibular first molar and the co-relation between left and right side occurrences, unilateral/bilateral occurrences and between males and females were recorded.

INTRODUCTION

Human molars show considerable anatomic variations and abnormalities with respect to crown, number of roots and root canals. These variations may be divided according to the site of their occurrence. Mandibular first molar is the earliest permanent posterior teeth to erupt. It usually has two roots- mesial and distal [Fig 1].

Figure 1

Fig 1: Mandibular first molar – buccal and lingual aspect



However, sometimes a third root is also found. This third root or the supernumerary root, which is a macrostructure, was first mentioned in the literature by Carabelli¹, and is called Radix Entomolaris [RE]. This supernumerary root is located distolingually in mandibular molars, mainly the first molars [Fig.2]. When this supernumerary root is present at

the mesio-buccal side, it is called Radix Paramolaris² [RP]. [Fig 3] RP is very rare and occurs less frequently than RE.

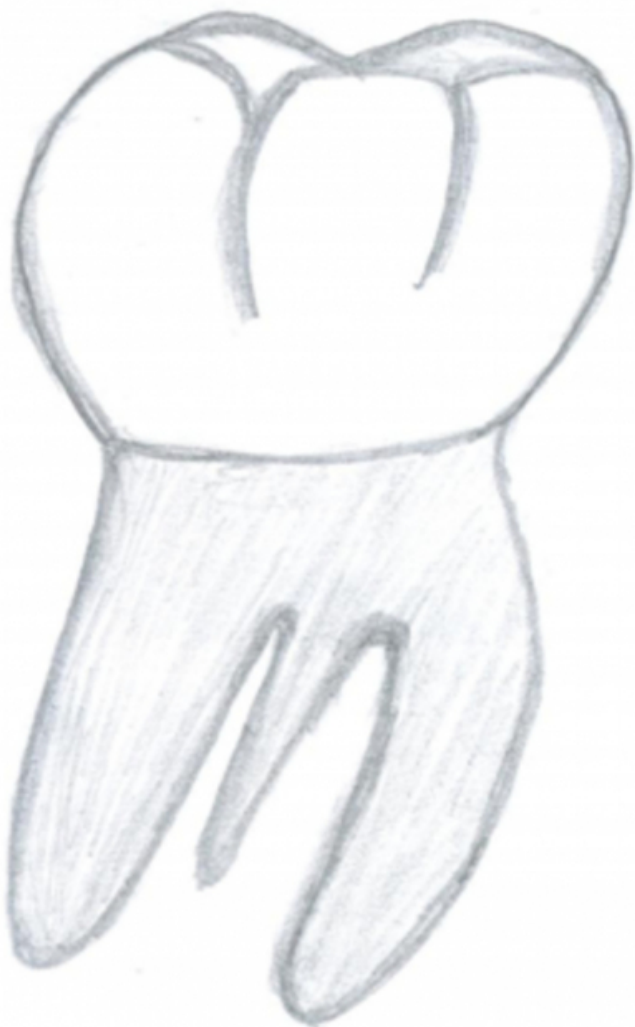
Figure 2

Fig – 2: Radix Entomolaris – mesial and distal curvature



Figure 3

Fig 3: Radix Paramolaris- Buccal aspect



The identification and external morphology of these root complexes, containing a lingual or buccal supernumerary root, are described by Carlsen Alexandersen³. They described four different types: A, B, C and AC. This classification allows for the identification of separate and non-separate RE. Type A and B refer to distally located cervical part of the RE with two normal root and one normal root component respectively. Type C refers to a mesially located cervical part. Type AC refers to a central location, between the distal and mesial root components.

According to the classification of De Moor et al⁴ 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 canal

Type II: initially curved entrance which continues as a straight root/ 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.

Studies on the frequency of three rooted mandibular first molars in various races have been performed previously [Table-1] and it was observed that the presence of a separate RE in the first mandibular molar is associated with certain ethnic groups. In African population, a maximum frequency of 3% is found;⁵ while in Eurasians the frequency is less than 5%⁶. In populations with mongoloid traits, such as Chinese, Eskimos and American-Indians, studies have shown a frequency ranging from 5% to more than 30%⁷⁻¹³. Due to high frequency of RE in these populations, it is considered to be a normal morphological variant [eumorphic root morphology]. As there is no exclusive study in Indian population, so the present study was carried out.

Figure 4

Table 1

Author/year	Population group	Incidence %	Study method
Taylor [1899] ¹⁴	United Kingdom	3.4%	Visual
Bolk [1915] ²	Netherlands	1%	Radiography
Campbell [1925] ¹⁵	Australian - Aborigine	0%	Uncertain
Hjelmmann [1929] ¹⁶	Finland	0.9%	uncertain
Fabian [1928] ¹⁷	Germany	1.6%	uncertain
Shaw [1931] ¹⁸	African -Bantu	0.0%	Uncertain
Tratman [1938]	Singapore Chinese	5.8%	radiography
	Malaysian	8.6%	Radiography
	Japanese	10.9%	Radiography
	Indians	0.2%	Radiography
	Eurasians	4.2%	Radiography
Laband [1941] ¹⁹	Malaysian Borneo	8.2%	Visual
Pedersen [1949] ⁸	Greenland Eskimo	12.5%	Visual
Somogyi Csizmazia and Simons [1971] ²⁰	Canadian -Indians	16%	Visual
	Japanese	17.8%	Radiography
De Souza-Freitas [1971] ²¹	European	3.2%	Radiography
	Caucasian	2.2%	Visual
Skidmore and Bjorndal [1971] ²²	Aleut -Eskimo	32%	Radiography
	American Indians	5.8%	Radiography

Figure 5

Author/year	Population group	Incidence %	Study method
Turner [1971] ⁹			
Curzon and Curzon [1971] ¹⁰	Keewatin Eskimo	27%	Visual
Curzon [1973] ²³	United Kingdom	3.4%	Visual
Curzon [1974] ²⁴	Baffin Eskimo	21.7%	Visual
Vertucci and William [1974] ²⁵	America	0.0%	Visual
Hochstetter [1975] ²⁶	Guam	13%	Radiography
Jones [1980] ²⁷	Chinese	13.4%	Visual
	Malaysian	16%	Visual
Reichart and Metah [1981] ¹²	Thai	19.2%	Visual
Walker and Quackenbush [1985] ¹³	Hong Kong [Chinese]	14.65	Radiography
Steelman [1986] ²⁸	Hispanic	3.2%	Uncertain
Walker [1988] ²⁹	Southern chinese	15.0%	Visual
Loh [1990] ³⁰	Singapore chinese	7.9%	Uncertain
Younes et al [1990] ³¹	Saudi	2.92%	uncertain
	Egyptian	0.01%	
Ferraz and Pecora [1992] ³²	Japanese	15%	Radiography
	Caucasian	4.2%	
	Negroid	2.8%	

Figure 6

Author/year	Population group	Incidence %	Study method
Yew and Chan [1992] ¹¹	Taiwan Chinese	21.5%	Radiography
Sperber and Moreau [1998] ⁵	Senegalese	3%	Radiography
Al -Nazhan [1999] ³³	Saudi -Arabian	5.97%	Radiography
Wasti [2000] ³⁴	South - Asian - Pakistani	0.0%	Visual
Gulabivala [2001] ³⁵	Burmese		Visual
Gulabivala [2002] ³⁶	Thai		Visual
Sert et al [2004] ³⁷	Turkish		Visual
De Moor [2004] ⁴	Caucasian		
Peiris [2007] ³⁸	Sri Lankan	3%	Visual
Tu M [2007] ³⁹	Taiwanese [Chinese]	21.09%	Radiography
E Schafer [2007] ⁴⁰	German	1.35%	Radiography
Rwenyonyi [2009] ⁴¹	Ugandan	0.0%	Visual
Chen [2009] ⁴²	Taiwan Chinese	19.5%	Visual

MATERIAL AND METHODS

A total of 1000 patients were screened with the help of orthopentogram [OPG] and two periapical radiographs were taken from two different horizontal angles [one of these taken in orthoradial position and the other taken either 30° mesially or distally. Out of these, 550 patients having both mandibular first molars were selected. Each of these patients was of Indian origin. Personal details including age, sex, and race were recorded.

The full mouth radiographs were taken using Kodak Ultraspeed films. The films were developed, fixed and dried in automatic processor. All radiographs were evaluated under optimal conditions for the presence of extra root. A thorough inspection of the preoperative radiograph and interpretation of particular marks or characteristics, such as unclear view or outline of the distal root contour or the root canal indicated the presence of hidden RE. To reveal the RE, a second radiograph was taken from a more mesial or distal angle.

RESULTS

Five hundred and fifty patients, out of which two hundred twenty five females and two hundred twenty five males, aged between 24-80 years were considered in this study. A total of 1100 mandibular first molars were evaluated, i. e., left molars comprised 550 teeth and right molars comprised 550 teeth. Eleven patients were found to have three rooted mandibular molar, of which seven were females and four males. [Fig 4-9] The incidence was 0.36% for males and 0.63% for females. The overall incidence of patients with three rooted mandibular first molar was 1%. Bilaterally three rooted mandibular first molar was present in only one patient [Fig 10]. The incidence of right and left three rooted mandibular first molar was 0.54% and 0.45% respectively. [Table-2]

Figure 7

Figure 4



Figure 9

Figure 6

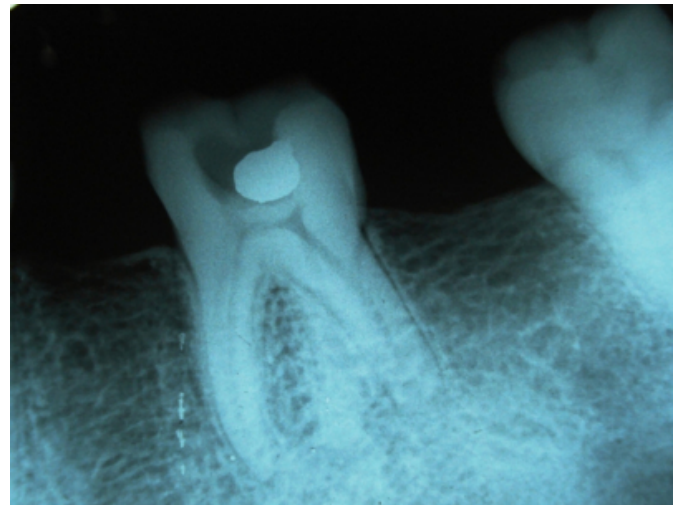


Figure 10

Figure 7

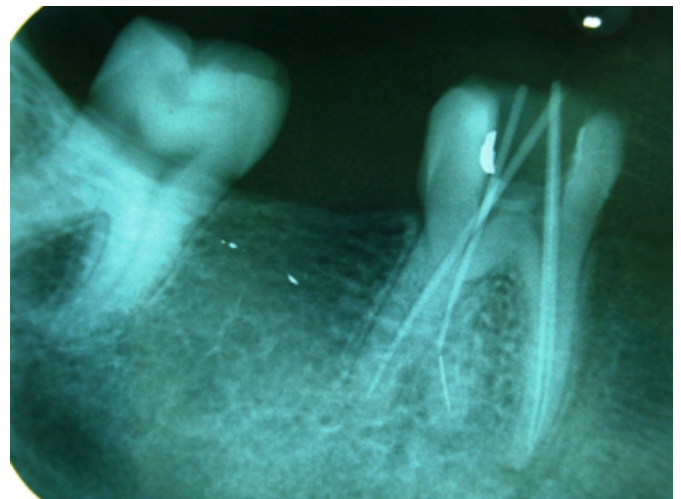


Figure 8

Figure 5

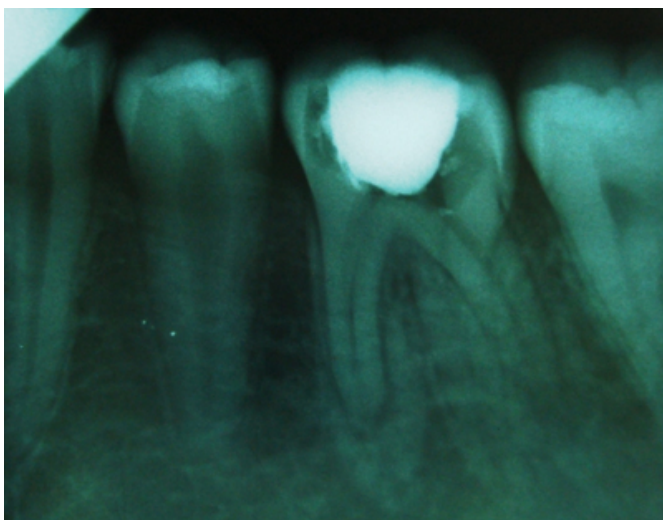


Figure 11

Figure 8

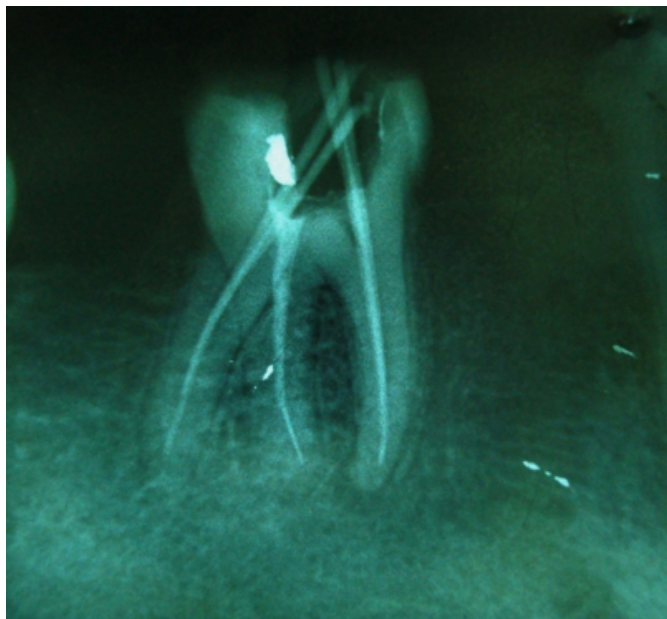


Figure 12

Figure 9

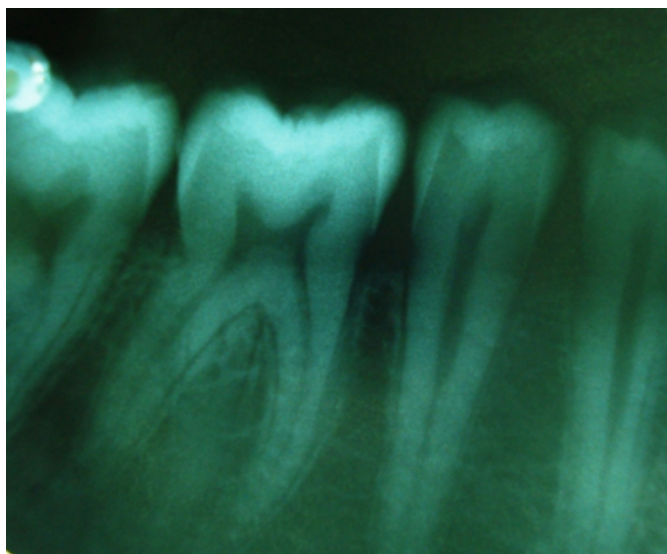


Figure 13

Figure 10

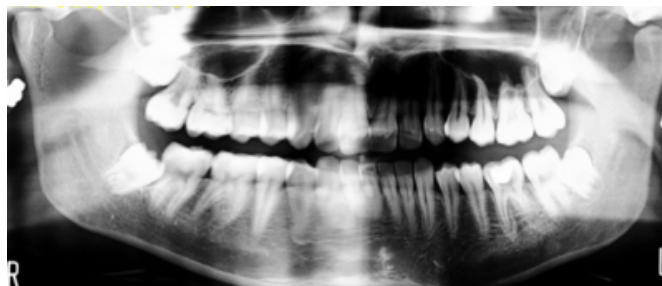


Figure 14

Table 2

No. of teeth		No. of three rooted molars					
		Right		Left		Total	
		n	%	n	%	n	%
Female	225	3+1*	0.36	2+1*	0.27	7	0.63
Male	225	2	0.18	2	0.18	4	0.36
Total	550	6	0.54	5	0.45	11	0.99

* Bilateral occurrence

DISCUSSION

Internal and external anatomy of teeth have shown that anatomical variations can occur in each group of teeth, in each person and in general in each racial group. There is that which can be called normal, in other words, that which is present in most cases, but anatomical alterations ought to be expected as a frequent possibility.

According to the present study, the occurrence of three rooted mandibular first molar in Indian population was 1% which was more than that was observed by Tratman in 1938 in Indian population but at the same time less than that observed in other Asians [Table-1]. The frequency of the extra distal root in the present study and the differences compared with those studies listed in Table – 1 indicate that the three rooted variation of the mandibular first molar may be genetic characteristic to an Asiatic racial background. In the present study there was considerable difference according to sex [male 0.36% and female 0.63%] which is not in agreement with previous studies which state that such dental aberrations did not differ with gender⁴¹. There was not a significant difference according to the side of occurrence [right -0.54% and left -0.45%]. However other studies reported that three rooted mandibular first molar occurred more frequently on the right side than on the left side⁴¹. These contradictory findings may be explained by marked differences in the sample size and in the method used,

making further investigations necessary. In the present study bilateral occurrence was found in one case only [figure- 10]. All the three rooted mandibular first molars were of radix entomolaris type. Radix paramolaris was not detected. According to the location of supernumerary root all were of Type –AC that is supernumerary root was centrally located between mesial and distal root [figure-5]. According to the curvature of root all were of Type -1. This root was smaller than distobuccal and mesial roots in all cases and were separate from other roots[figure-7]. Pulpal extension was radiographically visible. An extra cusp [Tuberculum paramolare] or more prominent occlusal distal cusp was present with these cases. [Fig- 5-9] In previous studies assessing the prevalence of three rooted mandibular first molar, mainly two different methods have been used. Although several authors have studied this aberrations directly from extracted teeth^{10,27,35} [visual], others have chosen a radiographic approach. Because latter method using radiographs is non invasive and allows a comparison relating to sex and bilateral occurrence differences⁴¹, this indirect method was used in the present study. Certainly, the limitations of the two–dimensional radiograph for the assessment of three dimensional root configuration of a tooth⁴⁰ and the fact that at least two periapical radiograph taken from two different horizontal angles [one of these taken in ortho-radial position and the other taken either 30° mesially or distally] are recommended for proper identification of three rooted mandibular molars⁴ must be taken into consideration when interpreting the present data. Nevertheless, according to Walker and Quackenbush¹³, the accuracy of a correct diagnosis of a three rooted mandibular molar is about 90% even when using only panoramic radiographs. In future, three dimensional radiographic techniques like microcomputed tomography scans may be more suitable for such kind investigations as already suggested previously⁴⁰.

The etiology behind the formation of radix is still unclear. In dysmorphic supernumerary roots, its formation could be related to external factors during odontogenesis or presence of an atavistic gene or polygenetic system [atavism is the reappearance of a trait after several generations of absence]. Third root anomalies may develop during tooth bud morpho-differentiation as a result of a developmental aberration of both the ectoderm and mesoderm. Its severity depends on the formation stage of the involved teeth. Curzon suggested that the three rooted molar trait has a high degree of genetic penetrance as its dominance was reflected in the fact that the

prevalence of the trait was similar in both pure Eskimo and Eskimo/ Caucasian mixes.

It is hypothesized that the presence of radix entomolaris adds to the stability of molars by providing an increased surface area of attachment to the alveolus³ but it may be a contributory factor in localized periodontal destruction due to greater periodontal loss in lingual than that in buccal sites.

CONCLUSION

Although Radix entomolaris is rare in Indian population, knowledge of their occurrence and location is important. The world today is no longer formed by races which do not mix, hence, awareness of racial anatomical variations must be known. Knowing about them is clinically relevant for endodontic and surgical purpose.

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