

Incidence of Fourth Canal in Mandibular Permanent First Molars: A Clinical Study

Soni Kumari¹ Ujwal Kumar² Kunal Kumar³ Abhijeet Anand⁴ Indrajeet Kumar⁵ Aastha^{6*}

¹Senior Lecturer, Department of Orthodontics and Dentofacial Orthopedic, Hazaribagh College of Dental Sciences and Hospital Hazaribagh, Jharkhand, India.

²Private Consultant, Patna, Bihar, India.

³Private Consultant, Patna, Bihar, India.

⁴UG Student, Patna Dental College and Hospital, Patna, Bihar, India.

⁵Private Consultant, Patna, Bihar, India.

⁶Private Consultant, Patna, Bihar, India.

ABSTRACT

Aim: This in- vivo study was to evaluate the incidence of fourth canal in mandibular first molars in a group of Indian population while doing routine endodontic practice.

Materials and Methods: 100 patients with mandibular first molars indicated for endodontic treatment were selected for the study. Preoperative radiographs were taken for evaluation. The teeth included in the study were both clinically and radiographically examined for the number of root canals.

Results: Out of the 100 root canal treated mandibular first molars, 43 teeth (43 %) had four canal, 56 teeth (56.00%) had three canals and 1 tooth (01.0%) has two canals. All the mesial roots had two canals except the one having just single canal in mesial root. Fourth canal was usually located in the distal root of the teeth.

Conclusion: From present study it can be concluded that the occurrence of three root canal in mandibular first molar is higher but presence of fourth canal is also high. Keeping in mind about the higher incidence of a fourth canal in distal root of mandibular first molar, will guide the operator for searching such additional canal.

Keywords: Incidence, Mandibular first molars, Root canal morphology.

INTRODUCTION

During root canal treatment procedure complete debridement (bio- mechanical reparation) and obturation of the entire root canal system is considered to be the main objective of the therapy. Therefore, the clinician must have accurate and exact knowledge of root canal anatomy of each tooth is crucial in order to achieve this goal¹. Sometimes a missing root canal can go untreated. This inability to locate extra canals will result in failure of endodontic treatment. Diagnostic measures are of great importance in locating root canal orifices. Careful interpretation of multiple pre-

treatment radiographs, adequate access and modification of the outline of the access cavity reparation, exploration of the tooth's interior and exterior and examination of the pulp chamber floor with appropriate magnification and illumination². The internal anatomy of the human teeth has been studied by many investigators using different techniques such as sectioning of teeth³, clearing techniques, radiography⁴, examination under operating microscope, examination with a scanning electron microscope⁵ and cone-beam computed tomography techniques⁶. Locating the position and

Received: Mar. 22, 2020; Accepted: May. 27, 2020

*Correspondence Dr. Aastha.

Private Consultant, Patna, Bihar, India.

Email: aasthapuja1321@gmail.com

number of root canals can be difficult especially when the tooth being treated is malposed, heavily restored, or calcified.

The earliest permanent posterior tooth to erupt, the mandibular first molar seems to be the tooth that most often requires root canal treatment. The tooth usually has two roots (mesial and distal) with two canals in the mesial root and one canal in the distal. The incidence of the study of root canal anatomy has endodontic as well as anthropological significance⁷. It is well known that tooth anatomy varies according to racial origin⁸. Therefore, it is very important to be familiar with variations in tooth anatomy and characteristic features in various racial groups since such knowledge can aid in location and negotiation of canals, as well as their subsequent management. four canals in the mandibular first molar has been reported in the literature between 22%-59%.⁹

The objective of present study was to clinically investigate the incidence of fourth canal in mandibular first molars in a group of population.

MATERIAL AND METHODS

100 patients with mandibular first molars indicated for endodontic treatment were selected for the study. Preoperative radiographs were taken for evaluation of root canal morphology, number of canals and periapical status. The teeth that were included in the study were those that require non-surgical intervention. The endodontic procedures were carried out as follows: Local anesthesia was administered. Under rubber dam isolation an access cavity was prepared with endo access bur with water coolant. In these teeth (mandibular first molars) the access cavity outline was modified to a more rectangular shape to expose the location of the second distal canal orifice. After the contents of the pulp chamber were removed, a sharp endodontic explorer was used to explore the developmental grooves carefully to locate the orifices of the canals. Copious amounts of 3% sodium hypochlorite irrigation were used. Periapical radiographs with different angles were taken for evaluation of the number of root canals and for confirmation of the working length with 10 no K file (Mani inc, Japan) were evaluated after inserting size 15,20 or 25 K files (Mani inc, Japan) in the canals. The teeth included in study were both

clinically and radiographically examined by endodontist.



Fig 1: pre- operative radiograph.



Fig 2: Access opening.



Fig 3: working length.

RESULTS

No of canals/tooth	No of teeth	%
3	43	43
4	56	56
2	01	01
Total	100	

Of the 100-root canal treated mandibular first molars, 43 teeth (43.00%) had four canal, 56 teeth (56.00%) had three canals and 1 tooth (01.00%) has two canals. All the mesial roots had two canals except the one having just single canal in mesial root. Fourth canal was usually located in the distal root of the teeth.

DISCUSSION

The cause of most endodontic failures is inadequate, incomplete biomechanical instrumentation of root canal system. This can result from inadequate knowledge of root canal anatomy, because one can never know before treatment how many root canals are in a tooth. The use of radiographic methods to study the morphology of the root canal system might appear to have certain disadvantages. The clinician could only see the tooth in a two-dimensional image, and conceivably extra root canals can be missed out on the radiograph. However, clinical examination (in vivo) remains the only noninvasive method available and the missing of canal in a two dimensional view can make overcome by taking radiograph in different angle and at the same time by using different file system in case of dilemma such as k file in one canal and H file in other canal of the same tooth. Therefore, and by strictly adhering to the radiographic criteria for determining the number of roots and root canals, this study reveals that the conventional concept of mandibular first molar have three canals in its two roots is not correct in all cases. In this study 43.00% teeth found with four canals, though it is not higher than the incidence of three canals (56.00%), but the difference was not so great. The findings of this study were in good accordance with the previously reported studies.^{10,11,12,13,1,15}.

Two fine, narrow canals (mesio-buccal and mesio-lingual) are usually present in the mesial root. They are discrete entities or possess a multiplicity of anastomoses and corridors connecting the two root canals as they proceed apically. The distal root generally present one wide canal that tapers evenly to the apex. A great variance in the number of canals in the distal root has been reported by Fabra-Campos in 1985 and Walker in 1988 with up to 47.6% having two canals which is very much similar with the finding of this study (46.19%). A comparison of the findings of this study with previous investigations reinforces the view that the

incidence of four root canals in the eastern part of india population appears to be high, but not higher than the incidence of three canals. In clinical practice, the important factors which help in locating and treating extra canals are the clinician's awareness of their presence and the allocation of sufficient time and effort to locate and treat these canals using all the available useful equipments.

CONCLUSION

The findings of this study are very important in assisting the dentist to provide adequate knowledge about the root canal morphology of the majority population of this country and about the possible morphological variations. Keeping in mind about the higher incidence of a fourth canal in distal root of mandibular first molar, will guide the operator for searching such additional canal. Thus, clinicians will develop skills necessary to locate, clean and shape the entire root canal system and will lead to higher level of endodontic success.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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