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INCIDENCE OF MID MESIAL CANAL IN MANDIBULAR FIRST MOLAR - A SPLIT MOUTH CBCT STUDY

Priyadharshini Suresh Babu¹, Anjaneyulu K²

¹Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai 77

²Reader, Department of Conservative Dentistry and Endodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai 77

¹151701018.sdc@saveetha.com, ²kanjaneyulu.sdc@saveetha.com

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ABSTRACT:

Mandibular molars have a complex root canal anatomy. Two canals in mesial root and one to two canals in distal root as common occurrence. The mid-mesial canal an occasional entry lies in the developmental groove between the mesiobuccal and mesiolingual canal. The aim of the study was to determine the incidence of mid-mesial canal in the mandibular first molars through CBCT scan. A total of 50 CBCT scans were obtained from the Radiology department of Saveetha Dental College. A total of 100 mandibular first molars were assessed. The data obtained were tabulated in excel and subjected to Chi-square test using SPSS software. A total of 20 mandibular first molars had mid-mesial canal which accounts for 20%. 80% of the patients lacked a mid-mesial canal. The study was not statistically significant as the p value was found to be $1.00 > 0.05$. The failure of the endodontic treatment can be reduced by using three dimensional radiographs like CBCT which provide to be a valuable adjunct in negotiating middle mesial canals. In this split mouth analysis it was found that a patient with mid-mesial canal in mandibular right first molars also had the mid-mesial canal on the left first molar.

INTRODUCTION

Endodontics is defined as the branch of dentistry that deals with the etiology, prevention, diagnosis and treatment of the disease and injuries that affect the dental pulp and periapical tissues. Endodontist's first priority is to save the maximum amount of the remaining tooth structure. The endodontic treatment mainly comprises procedures like pulp capping, pulpotomy and root canal treatment. Pulp extirpation is an initial procedure in root canal treatment.¹

Through debridement of necrotic and infected pulp tissue followed by complete sealing of the root canals is essential for the success of the endodontic treatment. Endodontic failures occur very often. Failure of the endodontic treatment can be assessed through clinical signs and symptoms, radiographic finding of the root canal treated tooth. Root fractures, broken instruments, root canal overfilling, root canal underfilling, mechanical perforations, missed canals, are some of the factors that cause failure of endodontic treatment.²

One such type of canal which is often missed in mandibular first molars is the middle mesial canal. Greatest challenge faced by clinicians is the root canal morphology therefore a thorough knowledge of the pulp space anatomy is essential.³ Periapical inflammation is found to be developed in areas where the missed canal is neither debrided nor thoroughly sealed. Difficulty in treating the complex root canal system can be eliminated through various diagnostic aids and procedures.⁴

In the process of clinical evaluation of dental patients imaging and radiology plays a significant role in diagnosis and treatment plan. The two dimensional radiographs have intrinsic limitations like magnification, superimposition, distortion and misinterpretation of structures.⁵ Cone Beam Computed Tomography (CBCT) paves way for the shift from 2D to 3D approach. CBCT uses a cone beam imaging technology with lower radiation dose and provides 3D view of maxilla, mandible and supporting structures with relatively higher spatial resolution. CBCT imaging has become an indispensable part of dental imaging armamentarium.⁶

CBCT works on the principle of tomosynthesis.⁷ A single rotational scan permits multiple planar projections through which inter-relational images can be generated and the image is generated within a few seconds to minutes. One of the major advantages of CBCT include viewing of thin sections of the field without superimposition of images. Hard tissue and soft tissue image can be obtained through CBCT scan.⁸

We have numerous highly cited publications on well designed clinical trials and lab studies⁹⁻²⁴. This has provided the right platforms for us to pursue the current study. Our aim is to determine the incidence of mid-mesial canal in the mandibular first molars through CBCT scan.

MATERIALS AND METHODS

50 CBCT scans involving the both arch were obtained from the Radiology Department of Saveetha Dental College. Mandibular first molars of both the left and right side of the mandible were assessed for the presence of mid-mesial canal. The total sample size obtained was 100. The mandibular molars were assessed in cross-sectional, transverse and panoramic view. The presence of mid mesial canals in the mesial root of the mandibular first molar was identified. The results obtained were tabulated in excel. The data was transferred and Statistical Package for Social Sciences (SPSS Software). The data was subjected to a Chi-square test for analysis of statistical significance. (Table 1).

RESULTS AND DISCUSSION

Out of the 50 CBCT scans, a total of 100 mandibular first molars were assessed for presence of mid-mesial canal in the mesial root. A total of 20 mandibular first molars had mid-mesial canal in the mesial root. The patient presented with a mid-mesial canal in 36 had mid-mesial canal in 46 also. 80% of the patients lacked a middle canal in the mandibular first molars. (Figure 6).

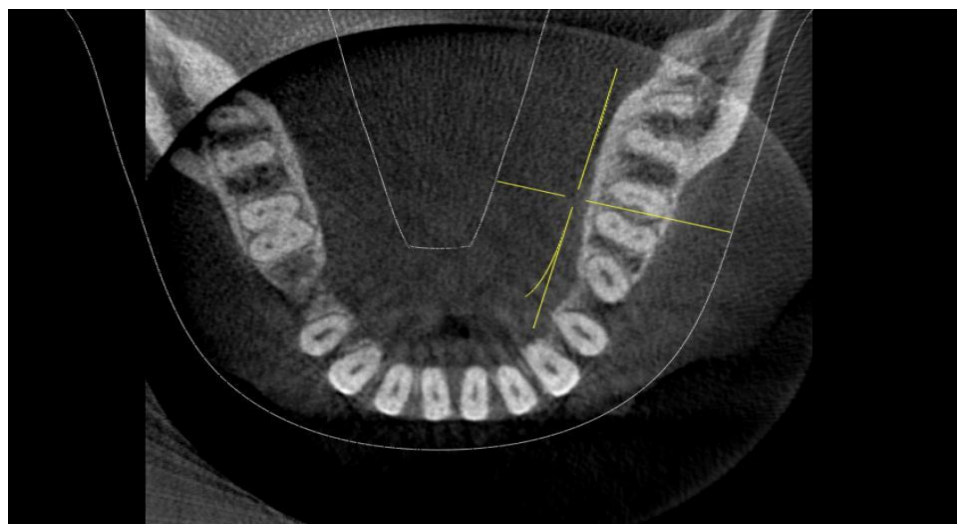


Figure 1: Depicts the presence of a mid-mesial canal in 46 in cross sectional view

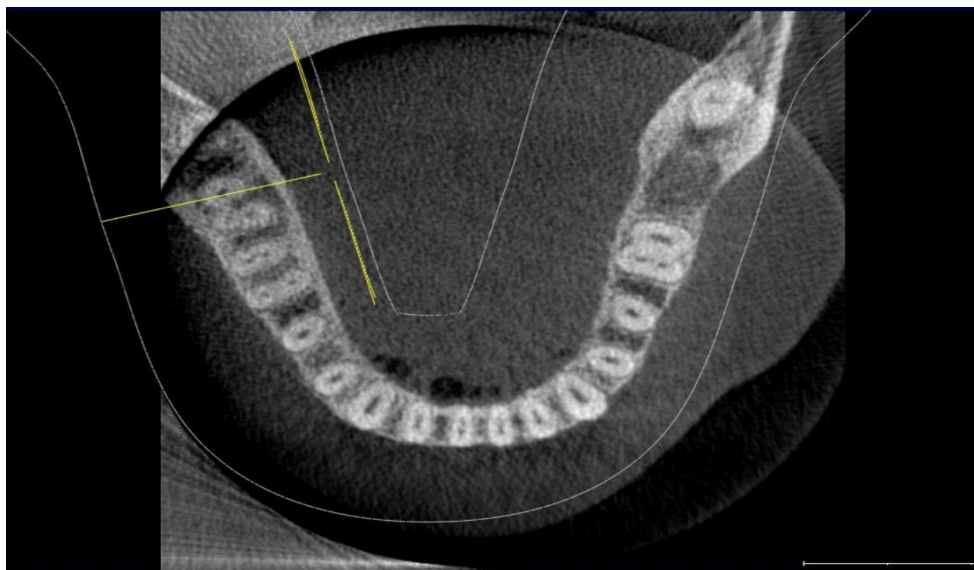


Figure 2: Depicts the presence of a mid-mesial canal in 46 in cross sectional view.

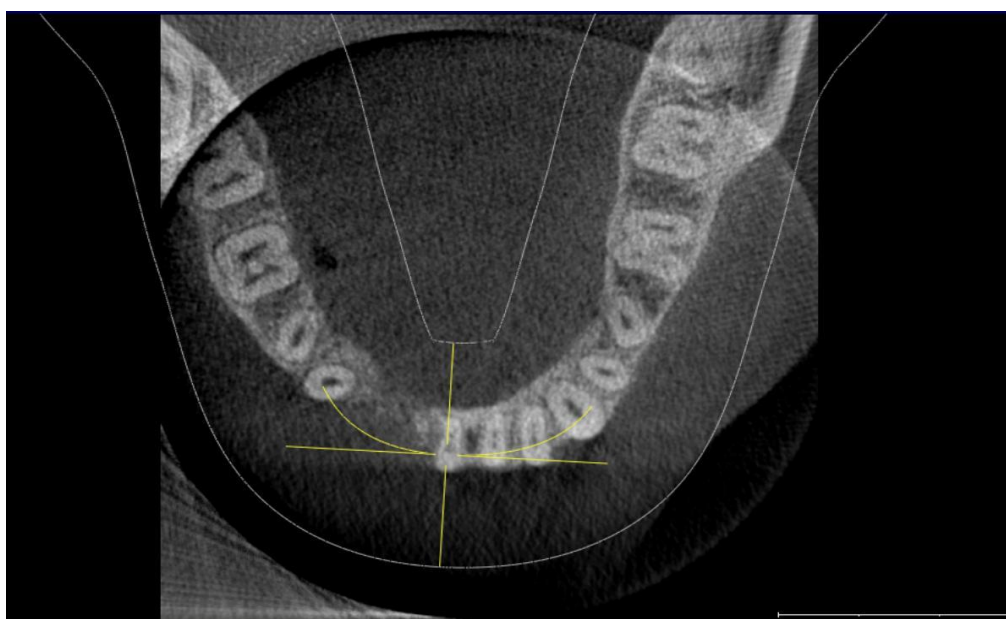


Figure 3: Depicts the presence of a mid-mesial canal in 46 in cross sectional view.

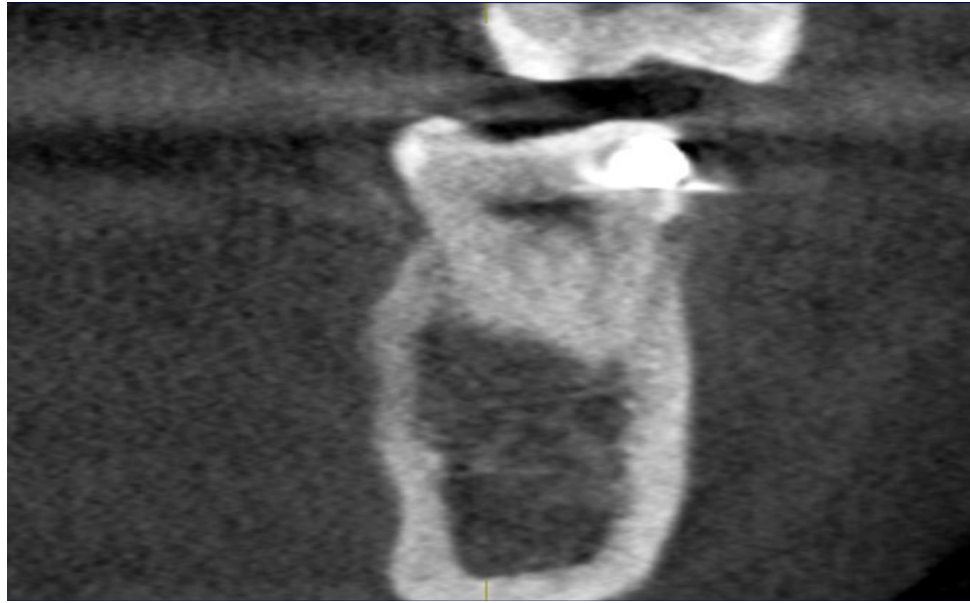


Figure 4: Depicts the presence of a mid-mesial canal in 36 in the transverse view.



Figure 5: Depicts the presence of a mid-mesial canal in 46 in the transverse view.

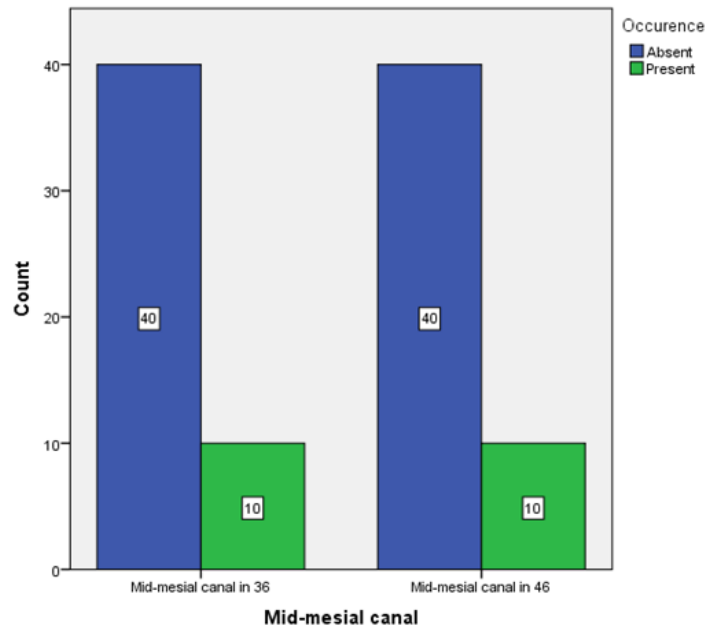


Figure 6 : The bar graph depicts the presence of a total mid-mesial canal in mandibular first molars on both sides of the mandible. The X-axis represents the presence of a mid-mesial canal. The Y-axis represents the number of mid-mesial canals present. Presence of mid-mesial canal denoted in green and absence denoted in blue. From this split mouth analysis it is evident that occurrence of mid-mesial canal in 36 is 10% which is similar to occurrence of mid-mesial canal in 46. So it can be inferred that if the right first molar (46) has a mid-mesial canal there occurs a presence of mid-mesial canal in the left first molar also (36). However, this was not statistically significant. Pearson Chi square, $P = 1.00 (> 0.05)$.

Table 1: Depicts the Chi-square test done for the presence of the mid-mesial canals. The p value was found to be $1.000 > 0.05$ which indicates the study is not statistically significant.

	Value	df	Asymp. Sig.(2-sided)
Pearson Chi-Square	0.000 ^a	1	1.000
Continuity Correction	.000	1	1.000
Likelihood ratio	0.00	1	1.000
Fisher's exact test			
No. of valid cases	100		

The most frequent endodontically treated tooth is the mandibular first molar. Mandibular molars are found to be presented with complex root canal anatomy. Generally the mandibular molars consist of mesial and distal roots. Mesial root of the mandibular first molar is commonly presented with a mesiobuccal (MB) and mesiolingual canal (ML) whereas the distal root is more commonly presented with one canal rather than two.²⁵

Variations seen in the root canal system of the mandibular first molar include the presence of C-shaped canals, separate distolingual root, an isthmus between the mesiobuccal (MB) and mesiolingual (ML) canals and a third canal in the mesial root known as the middle mesial (MM) canal.²⁶

Isthmus is a narrow connection between the two mesial and distal canal. The isthmus paves way for anatomical variation such as the middle canal.²⁷ Middle mesial canal orifice is found between the two main canals below the dentinal projection in the groove. The presence of extra and independent canal in the mesial root of the mandibular molars was first demonstrated by Vertucci and Williams.²⁸ Middle canal often referred as middle mesial canal (MMC) or middle distal canal (MDC) based on its location in the mesial or distal root of the mandibular first molars. Middle canal are also denoted as intermediate canal, accessory mesial canal, third mesial canal, mesio-central canal.²⁹

Middle mesial canal can be classified into three types as fin, confluent and independent. There is no separate orifice in the fin type and is usually presented with a small linear extension of MB or ML canal of very small length and allows free movement of file between fin and the main canal. Separate orifice is seen in confluent canal and it merges with the MB or ML canal. Separate orifice and separate exit is seen in independent type.^{30,31}

Careful clinical examination and radiographic inspection is essential for the detection of additional root canals. Multiple radiographs, sharp explorer for the examination of the pulpal floor and operating microscope for better visualisation of additional root canals.³²

Successful endodontic treatment depends on locating and treating all the canals. Multiple angled radiographs are required in conventional radiographic methods for locating the middle canal and successful endodontic treatment. Due to the amount of increased radiation exposure, multiple angled radiographs are not recommended to patients. Cone Beam Computed Tomography (CBCT) is advised as the amount of radiation dose exposed is less compared to that of multiple angled radiographs.³³ Figure 1, Figure 2, Figure 3 shows the presence of a mid-mesial canal in the mandibular first molar in the cross-sectional view of CBCT scan. Figure 4, Figure 5 depicts the presence of a mid-mesial canal in transverse view.

CBCT has emerged as a confirmatory diagnosis of morphologic aberrations in the endodontic field. Better understanding of the anatomy of root canal³⁴, root

canal preparation and obturation evaluation³⁵, bone lesion and vertical fracture detection.³⁶ has been successfully diagnosed through CBCT.

CONCLUSION

Three dimensional radiographs like CBCT provide to be a valuable adjunct in negotiating middle mesial canals. The failure of the endodontic treatment can be reduced at a rapid rate by treating these canals. In this split mouth analysis it was found that a patient with mid-mesial canal in mandibular right first molars also had the mid-mesial canal on the left first molar.

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Nil

CONFLICT OF INTEREST

Nil

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