

Retrospective study assessing the prevalence of second mesiobuccal root in permanent maxillary first molar among population of Hafar al Batin using the only CBCT in speciality Dental Centre

¹Dr Sadun Mohammad Al Ageel Albeaji, ²Dr Faleh Hamed Alshammari, ³Dr. Shikha Arya, ⁴Dr Noha Basil Alkhadra, ⁵Dr Zahra Abdulmohsen Alwesaibi, ⁶Dr Khalid Ali AlFadhli, ⁷Dr Rakan Mohammed AlHarbi

Corresponding Author: Dr Sadun Mohammad Al Ageel Albeaji, Consultant Endodontist and Head of Dentistry in Directorate of Hafar Al Batin, Ministry of Health Hafar Al Batin, Eastern Region, Saudi Arabia

Citation of this Article: Dr Sadun Mohammad Al Ageel Albeaji, Dr Faleh Hamed Alshammari, Dr Shikha Arya, Dr Noha Basil Alkhadr, Dr Zahra Abdulmohsen Alwesaibi, Dr Khalid Ali AlFadhli, Dr Rakan Mohammed AlHarbi, “Retrospective study assessing the prevalence of second mesiobuccal root in permanent maxillary first molar among population of Hafar al Batin using the only CBCT in speciality Dental Centre”, IJDSIR- January - 2022, Vol. – 5, Issue - 1, P. No. 228 – 233.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Aim: To assess the prevalence of the second mesiobuccal (MB2) canal in the MB root of permanent maxillary first molars in a Saudi sub-population using cone-beam computed tomography (CBCT)

Materials and Methods: This study was executed on CBCT images of Saudi patients seen at Regional Dental Centre, ministry of health (Hafar Al Batin). A total of 470 maxillary first molars were evaluated using CBCT software. The presence and prevalence of MB2 was calculated in terms of age, gender and tooth position.

Result: Statistically analysis of the data using Chi square test was done. Prevalence of MB2 canal in three rooted maxillary permanent first molar was 61.7%. Prevalence was highest in 20-40 years of age group. It was followed by >40 years and lowest in <20 years and

difference was statistically significant ($p=0.005$). There was no statistically significant difference in the prevalence based on gender and tooth position.

Conclusion: There is a high probability of finding MB2 canal in Saudi population.

Keywords: CBCT, MB2, Molar.

Introduction

A complete and detailed understanding of root canal anatomy of teeth plays a significant role in endodontic therapy. This is quite true in case of maxillary molars as these teeth show complex internal morphology. One of the most commonly treated teeth is maxillary first molar as it is one of the first teeth to erupt. They have a large pulp and three roots (mesiobuccal, disobuccal and palatal) with a maximum variation in terms of shape size and internal anatomy. (1) About 20% of these teeth need

non-surgical retreatment mainly due to missed canal in mesiobuccal root, a second mesiobuccal canal (MB2). (2)

In spite of being highly prevalent in maxillary molars, the MB2 canal are often undetected. Canal identification can be considered as the first critical step in debridement of canal. Failure to identify the canal will lead to failure to debride and obturate. (3, 4)

Many in vitro (5, 6) and in vivo (7-10) studies are done to detect the extra canal in mesiobuccal root of maxillary molar. However there is a discrepancy in the results of these studies with prevalence of mb2 ranging from 18.6% (11) to 96.1% (12). This variation is due to the different methods opted for detection of canal and also the different ages and races evaluated.

Of late, 3D imaging technology is being used to detect MB2 canal, as these techniques are more reliable in detecting the canal and the image resolution is enhanced. One such technology is CBCT. (13)

A large number of patients undergo CBCT during course of their dental treatment and these images can be used in canal morphology studies. Also during CBCT imaging the general data of the patient is entered which can be used to study and compare age, gender and race related parameters.

The aim of present study was to assess the prevalence of MB2 canal in the mesiobuccal root of maxillary first molar in Saudi population using CBCT.

Materials and methods

This retrospective study was carried out on CBCT images of Saudi patients seen at Regional Dental Centre, Ministry of Health (Hafar Al Batin). Ethical clearance was obtained. A total of 470 maxillary first molars were evaluated using CBCT software. These scans were of 246 male and 224 female. The included scans were from patient age between 16 and 60 years. The prevalence of

MB2 was calculated. The presence of MB2 canal was correlated with age, gender and tooth position.

The scans were recorded from GENDEX GXDP -700 3D scanner, with the scanning parameters Focal spot 0.5 mm, Image voxel size 85 – 330 μ m, Scan time 11-21 secs, Exposure time 1.2-12.6secs and image volume sizes (H×W) 61×41, 61×78mm. The axial planes were analysed at 0.5 mm intervals and 1 mm thickness.

Statistical analysis

All characteristics were summarized descriptively. For continuous variables, the summary statistics of mean \pm standard deviation (SD) were used. For categorical data, the number and percentage were used in the data summaries and diagrammatic presentation. Chi-square (χ^2) test was used for association between two categorical variables.

If the p-value was < 0.05 , then the results were considered to be statistically significant otherwise it was considered as not statistically significant. Data were analysed using SPSS software v.23 (IBM Statistics, Chicago, USA)

Results

Out of 470 maxillary first molars evaluated, in 290 (61.7%) teeth Mb2 was present. It was observed that 20-40 years age group (66.7%) had the highest prevalence of Mb2 which was followed by >40 years (55.7%) and lowest prevalence was in <20 years (48.7%). No statistically significant difference was found in terms of tooth position i.e. right and left ($p=0.55$) and gender ($p=0.23$).

Table 1: Frequency of Mb2 in terms of age

Mb2	<20 years (n=80)	20-40 years (n=286)	>40 years (n=104)	x2 Value	P-Value
	n %	n %	n %		
Present	39 48.7	191 66.7	58 55.7		
Absent	41 51.2	95 33.2	46 44.2	10.27	0.005 *

*p < 0.05 - Statistically Significant.

Total number of maxillary first molar n = 470	Gender	Tooth position Right left
	Male Female	
Number of teeth	158/246 132/224	145/230 145/240
Frequency of Mb3	64.2% 58.9%	63% 58.9%
P value	0.55	0.23

*p < 0.05 - Statistically Significant.

Discussion

Canal identification can be considered as the first critical step in canal debridement. A significant challenge is created by Mb2 canals in maxillary first molars as these are missed and go undetected many times during endodontic treatment. (4) The complex morphology and variations in mesiobuccal root of maxillary molar can be directly related to difficulty in canal identification. (14) This discrepancy in in vitro and in vivo studies could be due to difference in the methods used for detection and also because different ages and races were evaluated. The likelihood of finding Mb2 canal was increased in clinical studies in which various examination methods were used. (15)

The mesiobuccal root is broader buccolingually and comparatively slender mesiodistally and thus it is difficult to visualize canal anatomy in conventional periapical radiographs (16). The mesiobuccal root canals are aligned in a buccolingual plane (17). The proximity of Mb2 canal to the main canal and it's small width make it difficult to be detected and differentiated from each other in buccolingual dimension. (18)

Nowadays Mb2 canal can be detected more frequently using 3D imaging techniques. It is more reliable in detecting Mb2 and also the image resolution is increased (13). CBCT is an indispensable method through which detailed anatomic features of the tooth can be identified which are often missed by conventional periapical or panoramic images. It helps in determining any kind of abnormality in tooth morphology or an extra canal in root canal system. (19) As large number of patients might need CBCT during their dental treatment, it can be used in canal morphology studies. It also gives an information about patient's age, race and gender. (15)

The present study is a retrospective study on a group of population in Hafer Al Batin to check for the prevalence of Mb2 canal in maxillary first permanent molar. In this study CBCT was used to gather the information.

The incidence of MB2 canal was 61.7%, this high prevalence rate is consistent with the previous studies done on Saudi population (9,15, 20,21). This also indicates that CBCT technique is a useful tool in identification and confirmation of additional canals in roots (20). The higher prevalence could be due to larger sample size.

In some of the previous studies it was found that male had a higher prevalence of Mb2 canal (20,22). But in our study there was no statistically significant difference in the prevalence of canal based on gender and also no difference based on tooth position.

In this study age group of <20 years and >40 years showed less prevalence of Mb2 canal as compared to 20-40 years. The lower prevalence in younger age group can be due to presence of a wide single mesiobuccal orifice. With an increase in age there is deposition of secondary dentin that divides the wide orifice into 2 separate orifices. In >40 years, the comparatively lower prevalence could be due to calcification of narrow Mb2 canal. (1)

Use of CBCT for preintervention diagnosis has been recommended by some author (23). American Association of Endodontics, American Academy of Oral and Maxillofacial Radiology and European society of Endodontology has also recommended this approach to assess the complexity of root canal system. (24, 25)

Nevertheless, it should always be kept in mind, even though CBCT plays an important role in endodontics it has to be used judiciously in daily clinical practice. One should consider that patient is being exposed to ionizing radiation and evaluate relative risk. It is of indispensable importance for the patient that the exposure through radiation is kept as low as judiciously possible (26). As it is well documented through previous studies that there is a high prevalence of Mb2 canal, one must always explore for an extra canal in Mb root. This can be done by modifying the access, using magnification and illumination. In a study it was observed that Mb2 is present 2 mm apical to floor of pulp chamber. Hence removal of 0.5-3mm of dentin to expose these orifice with ultrasonic under magnification could be useful. (1)

Conclusion

In this study, majority of population (61.7%) included had four canals in permanent maxillary first molar. There was no statistically significant difference in male and female and tooth position i.e right and left. Age group between 20-40 years had more prevalence of Mb2.

Having a prior knowledge of this anatomic variation helps a clinician to locate and treat all the canals. Based on the studies available it is important to consider the existence of Mb2 canal for best results in treatment of maxillary first molar.

In order to find Mb2 canal, there should be modification in shape of access cavity from triangular to rhomboidal, use of ultrasonic, magnification and if needed troughing of pulpal floor to depth of about 2mm.

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