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ORIGINAL ARTICLE

SECOND MESIOBUCCAL CANALS IN MAXILLARY FIRST MOLARS DETECTED USING CONE-BEAM COMPUTED TOMOGRAPHY

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ABSTRACT

OBJECTIVE: To determine the numbers of second mesiobuccal canals of first permanent maxillary molars by Cone-Beam Computed Tomography (CBCT).

METHODS: In this cross-sectional study, data of patients requiring CBCT images as part of their dental procedures were retrieved from the database of the radiology department of Sardar Begum Dental College, Peshawar, Pakistan. CBCT images of 100 maxillary 1st molars from 2016 to 2018 were selected by using consecutive sampling technique. Selection criteria for teeth were no prior endodontic treatment and roots formation completed, while teeth with open root apices and pathology were excluded. All teeth were analyzed in three planes (sagittal, axial, and coronal) and canal numbers per root were recorded. Descriptive statistics were computed in SPSS 20.0. Stratification was done for canals number in maxillary 1st molar among genders and age groups. Post, stratification Chi-Square/Fisher Exact test was applied to see effect modification.

RESULTS: The mean age of patients was 27.41±13.22 years. Second mesiobuccal canal (MB2) was present in 56 (56%) cases. Frequency of second mesiobuccal canal was more in female patients (n=29/40; 72.5%) than male patients (n=27/60; 45%) [p=0.007]. Overall, the most common age group was 10-25 years (57%) followed by 26-50 years (34%). Frequency of second mesiobuccal canal was 45.6% (n=26/57), 61.8% (n=21/34) & 100% (n=9/9) in age groups 10-25 years, 26-50 years & >50 years, respectively (p=.004).

CONCLUSION: A high frequency was recorded for second mesiobuccal canal in upper first molars and a significant association was noted for second mesiobuccal canal with gender and age group.

KEY WORDS: Canal Configuration (MeSH); Second mesiobuccal canal (Non-MeSH); Maxillary first molar (Non-MeSH); Extra canal (Non-MeSH); Missed canal (Non-MeSH); Cone-Beam Computed Tomography (MeSH); Molar (MeSH).

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INTRODUCTION

Though the dental pulp is physically smaller in size, an inflammation of dental pulp of teeth causes unbearable and merciless pain to a person.[1] The dental pulp due to its unique location can be both difficult to locate and extirpate. So, a deep knowledge of root canal morphology and anatomy is of utmost importance when performing endodontic treatment.[1,2]

One of the reason for root canal treatment failure in upper molars is the lack of ability to locate second mesiobuccal canal (MB2).[3] The location and treatment of the MB2 in maxillary 1st molars have been facilitated due to improvement in illumination and magnificatntecnology.[4] Morphology of maxillary molars is complex. Most of the investigations reported 50% prevalence of extra canal (MB2).[5,6] However, according to a research the occurrence of MB2 in upper first molars is up to 63%.[7] And re-endodontic treated teeth were containing more non-located MB2 canals, which shows that failure to treat the MB2 canals results in bad prognosis.[8] In recent times, Cone-Beam Computed Tomography (CBCT) images have been introduced which is more accurate and provide three dimensions anatomic details for diagnosis and treatment planning before starting endodontic therapy.[9,10]

The rationale of this study was that the location second canal (MB2) in the mesiobuccal root is very difficult because the excess dentin is deposited at the canal orifice and also it is difficult to visualize maxillary molars access cavity. If MB2 is missed while performing root canal treatment then can results in persistent pain and failure of root canal treatment. As CBCT provides three-dimensional (3-D) imaging and chance of missing MB2 is almost negligible; therefore, this study can show the real frequency of MB2 in our population. Incidence of a MB2 in the mesial root of first molars is not investigated in population of Peshawar. The frequency rate will redirect the attention of clinicians to its presence and not to miss canal during endodontic treatment. The objective of this study was to find out the frequency of a second mesiobuccal canal of maxillary first molars in patients requiring CBCT images as part of their dental procedures in local hospital of Peshawar Pakistan.

METHODS

In this descriptive cross-sectional, study CBCT images of 100 maxillary first molars of Peshawar population (60

TABLE I: FREQUENCY OF GENDER, SIDE OF UPPER FIRST MOLAR, SECOND MESIOBUCCAL CANAL AND AGE CATEGORIES

Variables	Categorical Variable	Frequency (n=100)	Percentage
Gender	Male	60	60
	Female	40	40
Side of Upper First Molar	Right	44	44
	Left	56	56
Second Mesiobuccal Canal	Yes	56	56
	No	44	44
Age groups (years)	10-25	57	57
	26-50	34	34
	greater than 50	9	9

TABLE II: FREQUENCY OF SECOND MESIOBUCCAL CANAL STRATIFIED BY GENDER

Gender of patient	Second Mesiobuccal Canal				x^2	P-value*
	Yes (n=56)		No (n=44)			
	Frequency	Percentage	Frequency	Percentage		
Male (n=60)	27	45.0	33	55.0	7.366	0.007
Female (n=40)	29	72.5	11	27.5		

*Pearson Chi-Square Test

TABLE III: FREQUENCY OF SECOND MESIOBUCCAL CANAL STRATIFIED BY AGE CATEGORIES

Age groups (years)	Second Mesiobuccal Canal				P-value*
	Yes (n=56)		No (n=44)		
	Frequency	Percentage	Frequency	Percentage	
10-25 (n=57)	26	45.6	31	54.4	0.004
26-50 (n=34)	21	61.8	13	38.2	
> 50 (n=9)	9	100	0	0	

* Fisher's Exact Test

males and 40 females) were retrieved from the database of the radiology department of Sardar Begum Dental College, Peshawar, Pakistan. Ethical approval was obtained from Hospital Ethical Research Committee. The gender distribution was not equal due to existing pattern of the data that was retrieved consecutively from the images based on date of admission. These patients were referred to radiology department between 2016 and 2018 and needed CBCT images as part of their dental procedures. The selected teeth were upper first permanent molars with no prior endodontic treatment and roots formation completed. Teeth with root apices open and pathology were excluded. All teeth were analyzed in sagittal, axial, and coronal planes[2] and canals number per root were recorded.

Statistical analysis was done in SPSS 20.0. Mean and standard deviation was calculated for numerical variables like age. Percentages and frequencies were calculated for categorical variables like gender and number of canal in maxillary first molar. Stratification was done for number of canals in maxillary first molar among genders and age groups. Post stratification Chi-Square/Fisher-Exact test was applied to see effect modification and p-value ≤0.05 was considered significant.

RESULTS

The mean age of patients was 27.41±13.22 years. Of total 100 CBCT images, 60 (60%) were of males and 40 (40%) were of females. In majority of cases (n=56; 56%) maxillary first molar CBCT scans were available for left side. First mesiobuccal canal were present in all cases. The overall frequency for second mesiobuccal canal (MB2) was 56 (56%). Most common age group was 10-25 years (57%) [Table: I]. Frequency of second mesiobuccal canal was more common on right side (n=42, 95.5%).

Frequency of second mesiobuccal canal was more in female patients (n=29/40; 72.5%) than male (n=27/60; 45%) patients (p=0.007) [Table II].

With increasing age, the frequency of second mesiobuccal canal was shown to be decreased. Frequency of second mesiobuccal canal was 45.6% (n=26/57) and 61.8% (n=21/34) in age groups 10-25 years and 26-50 years respectively (p=.004) [Table: III].

DISCUSSION

In this study about the frequency of MB2 canal in upper 1st permanent molar by CBCT method showed that MB2 was found in 56% overall and more in females than males (P=.007). With increasing age the frequency of second mesiobuccal canal was shown decrease (P=.004) and MB2 more common on right side (P<0.001).

CBCT is far better in locating root canal instead of conventional x-ray. Conventional X-rays can combat the problem of superimposition. CBCT is three dimensional in nature and can give three views (sagittal, axial and coronal) plus one three 3-D reconstructed view. The clinicians can easily observe and measured all the area in the scan by moving the computer mouse.[11]

For successful root canal treatment the canal identification is critical. Karabucak, et al.[12] in a retrospective cohort study assessed frequency of undiagnosed canals in root canal treated teeth using CBCT scans. They reported that in case of missed canal the tooth was 4.38 times more likely to have associated periapical pathology. They further found, the MB2 canal was the most often missed canal.

Our findings showed that the overall frequency for second mesiobuccal canal (MB2) was n=56(56%). This shows that in more than half cases there is second canal present.

A study by Agwan, et al.[13] on Saudi Arabian population determined the frequency of MB2 in maxillary 1st molar. They used surgical telescopes, headlamps along with modified access preparations. Their results showed that

45% cases have second mesiobuccal canal in mesiobuccal root. The higher frequency in our study may due to the fact that we used CBCT method which is more effective in locating and detecting the MB2.

A CBCT based study by Hiebert, et al.[2] on MB2 canal occurrence in upper maxillary first molar in California reported that the prevalence of MB2 canals was found in 69% patients. The frequency for MB2 canal in their study is much higher than our study. This may be due to many reasons like sample size, experience with CBCT interpretation, genetic and ethnic variations.

A recent study by Alfouzan, et al.[14] on Saudi population on MB2 canal occurrence in upper maxillary first molar using CBCT reported that the frequency of MB2 canal was 70%. This frequency is much higher from our study. This variation in results can be attributed to racial differences, age of the participants, and experience of operator etc. In younger age, the canals are patent and are not calcified so more easily located.

In a study by Goldman, et al.[15] showed that different individuals interpret images differently. Parker, et al.[16] assessed various categories of individuals in detecting periapical pathology in CBCT images and compared this with oral and maxillofacial radiologists interpretation. They reported that a correlation exist between clinician's experience level for proper diagnosis. In another investigation[17], it was found that dentist will be more facilitated to assess endodontic problems using CBCT imaging compared with other experts.

In the current study, frequency of MB2 canal was more in female gender than males. These variations for frequency of second mesiobuccal canal among genders were statistically significant. similar results were reported by Saudi Arabian study.[13]

Our finding showed that with increase in age of the population, the frequency of MB2 also increases. It is against the fact that as the age advances the canals become calcified and obliterated as shown in a study.[13]

This is the first of kind of study in Peshawar to determine the frequency of MB2 canal in maxillary first molar using CBCT. This can help the clinician to know the real frequency of MB2. However, our study is of small sample, single center and retrospective design. So it is recommended to read the results with caution.

CONCLUSION

A high frequency was recorded for second mesiobuccal canal in upper first molars and a significant association was noted for second mesiobuccal canal with gender and age group.

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AUTHORS' CONTRIBUTIONS

Following authors have made substantial contributions to the manuscript as under:

TM: Conception and study design, acquisition of data, drafting the manuscript, critical review, final approval of the version to be published.

NS & WQ: Analysis and interpretation of data, drafting the manuscript, final approval of the version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declared no conflict of interest

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