



Frequency of Second Mesio Buccal Canal in Permanent Maxillary First Molars Among Tirupathi Population: A Retrospective Study

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Abstract

Introduction: The success or failure of the root canal treatment depends on proper bio-mechanical preparation and obturation. However, a missed canal might be the foremost reason for failure of a tooth that seems to be properly treated. The canal that is often missed without much attention is second mesio-buccal canal of maxillary molars. **Purpose:** To investigate the incidence of MB2 canals in Maxillary first molars among Tirupathi population. **Material and Methods:** A survey was carried out in Tirupathi and data was obtained from the dental practitioners and from our dental college for the past one year. **Results:** Out of 6945 maxillary first molars a total of 2534 MB2 canals were located and filled. A high statistically significant difference ($p < 0.0001$) in the occurrence of MB2 canals in males compared to females and left maxillary first molars comparative to the right molars was observed. **Conclusion:** The percentage of MB2 canals in maxillary first molar derived in the present study was 36.49%.

Key Words

Maxillary first molar, MB2 canal, Endodontics

Introduction

The foremost objective of root canal therapy is a well-defined access, complete cleaning, disinfection followed by three dimensional obturation (1). Maxillary first molar is the tooth with largest volume, most complex root and root canal anatomy, and possibly most treated and least understood posterior tooth. MB2 canal is one of the biggest mysteries in Endodontics. It has been found that endodontically retreated teeth contain more undetected MB2 canals, attributing to failure to locate, debride, and fill existing MB2 canals leading to a poorer prognosis (2). So, the present study aims to investigate the percentage of MB2 canals in Chittoor district, Andhra

Pradesh, India.

Material and Methods

A survey was carried out in Tirupathi and data was obtained from the dental practitioners and from our institution for the past one year. A data on a total of 6945 maxillary first molars was obtained from the previous records out of which 3231 are males and 3714 are females. Information on the quadrants basis is also noted as right and left. The percentage of MB2 canals from all the maxillary first molars was calculated based on the availability of radiographs. The incidence of MB2 canals

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Manuscript Received: 25 April 2020; **Revision Accepted:** 22 June 2020;

Published Online First: 15 December 2020

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Cite this article as: Sahiti JS, Krishna VN, Prasad SD, Kumar CS, Kumar SS, Suma RB. Frequency of second mesio buccal canal in permanent maxillary first molars among Tirupathi population: a retrospective study. JK Science 2020;22(4):198-201.



in maxillary first molars was attained based on the data available and statistical analysis was done. The chi-square test was used to analyze the significance.

Results

The data obtained on the second mesiobuccal canals of maxillary first molars was statistically analyzed and tabulated. Out of 6945 maxillary first molars a total of 2534 MB2 canals were located and filled. The level of

significance is set as $p < 0.05$. There was a high statistically significant difference ($p < 0.0001$) in the occurrence of MB2 canals in males compared to females (Table 1). Also, a high significant difference ($p < 0.0001$) was noted in the incidence of MB2 canals in the left maxillary first molars comparative to the right molars (Table 2). Irrespective of gender and quadrants, the percentage of MB2 canals obtained was 36.49% (Table 3).

Table 1: Percentage of MB2 Canal in Males and Females

Gender	Total	MB2		Chi-square	p value
	N	N	%		
Males	3231	1505	59.39	123.000	<0.0001 (Statistically significant)
Females	3714	1029	40.61		
Total	6945	2534	100		

Table 3: Percentage of MB2 Canal

	Right	Left	MB2	Total
N	1335	1199	2534	6945
%	52.68	47.32	36.49	100

Table 2 Percentage of MB2 Canal in Right and Left Quadrants

Gender	Total Right Molars	Right Molar		Total Left Molars	Left Molar		Total	Chi-square	p value
		N	%		N	%			
Males	1606	738	55.28	1625	767	63.97	3231	19.774	<0.0001
Females	2012	597	44.72	1702	432	36.03	3714		
Total	3618	1335	100	3327	1199	100	6945		

Discussion

The frequency of missed canals is strictly related to the morphology of the root canal system. This complexity can be compensated to a significant extent in Maxillary molars, by assuming that there are two canals in the mesiobuccal root until it is proven that there is only one, thereby decreasing the chance of missed canals.

Wide variation has been observed in clinical studies by various authors in different countries. In a study by Seidberg *et al.*, 33.3% of the first molars were reported to have an MB2 canal (3). Similar results were reported in a study by Pomeranz and Fishelberg, about 31% of the maxillary first molars were found to have an MB2 canal (4). Varying percentages of MB2 canals were reported by many authors in different populations such as Saudi, Egypt, Kuwait, Jordanian, Iranian, Chinese, Caucasian, Japanese to be 55.6%, 65%, 42%, 56.7%, 70.2%, 69%, 28-62% and 54% respectively with very less number of studies in India (5-11). In the present retrospective study, the frequency of the incidence of MB2 canal in maxillary first molar is comparable with the percentages reported by Salem *et al.* (7) and Das *et al.* (12). in their studies. The percentage was calculated based on three factors

gender, quadrants and familial. However, familial history was not considered as the incidence is infrequent.

The MB2 orifice in maxillary molars is usually traced either mesial to or in the pulpal groove connecting the main mesiobuccal canal and palatal canals, within 3.5 mm palatally and 2 mm mesially from the main mesiobuccal canal (12). Some instances, where MB2 might be found after cleaning and shaping of the other canals. The canal may be configured as a single canal till the apex or it might be merged with main mesiobuccal canal as 2-1 (type II) configuration given by Vertucci which happens in most of the situations and can be mentioned as a reason for the tooth not being symptomatic in some cases with missed second mesiobuccal canals as the first mesial canal is shaped and sealed (13). Fogel *et al.* reported that, out of 208 maxillary first molars, 148 (71.2%) mesiobuccal roots, two canals were located and treated (14). Of those, 82 (39.4%) had two canals that joined (Weine Type II), 60 (28.9%) cases only one canal was located and 66 (31.7%) had two separate apical foramina (Weine Type III).

Weine *et al.* were one of the first to propose that the



failure of endodontic treatment of maxillary molars is likely due to the failure to locate and fill the MB2 canal (11). The incidence of failure of endodontic treatment because of not treating MB2 canal in maxillary first molar is 48% (15). The incidence of MB2 canal in first molar retreatments was 67% compared to a 59% incidence in initial treatments (16). The significant difference in the incidence of MB2 canal between initial treatments and retreatments suggests that failure to find and treat existing MB2 canals will decrease the long-term prognosis. Sealing the main mesiobuccal canal might be the reason for some teeth being asymptomatic with uninterrupted MB2 canal.

The frequency of MB2 canals varied between 18% and 96% (17). It may be theorized that this broad range can be ascribed to the methods used for the determination of additional canals. For instance, it has been found that MB2 canals were identified significantly less frequently in clinical studies compared to in vitro investigations (18). The incidence of MB2 canal was higher in laboratory studies (60.5%) compared to clinical studies (54.7%).

The incidence is as low as 17% reported by authors with no magnification (19). Studies by various authors have presented the use of microscope, loupes, ultrasonics and advanced imaging techniques such as cone beam computed tomography (CBCT) and spiral computed tomography for detection ascending the percentage of MB2 in maxillary molars. Out of 100 Dental CTs that were evaluated for presence of additional canals in a study, a total of 61 MB2 canals were detected in maxillary molars, 39 MB2 canals were seen in maxillary first molar while 19 MB2 canals in maxillary second molar (20). The results from a study showed that 69.23% of the sample teeth had four canal orifices using spiral computed tomography of North Indian population (19).

In recent clinical studies, the more frequent use of an operating microscope or loupes in the clinical detection of the MB2 canal has resulted in an increased prevalence. A study by Sempira and Hartwell found that the use of an operating microscope did increase the incidence of MB2 (21). MB2 canals were detected in 36%, 54% and 72% of the teeth using direct vision, operating microscope alone and with selective dentin removal in Stages I-III, respectively by Das *et al.* The study demonstrated that dental operating microscope (DOM), when used along with good clinical knowledge and adjunctive aids such as selective dentin troughing/removal and will increase the ability of the dental clinician to locate MB2 canals (12).

Ultrasonic diamond tips such as (ET40D tip) can be applied at medium speed and with light force along the

mesiobuccal subpulpal groove extending palatally from the main Mesiobuccal canal orifice, with continuous water irrigation. According to a study, a significant difference was found between no microscopy and microscopy applications for the detection of the MB2 canal. The percentage of MB2 increased to 74% when the microscope is used with ultrasonics (22). Several aids such as rhomboidal access cavity preparation apart from the regular triangular outline form, using sharp and specific instruments such as DG16 explorer, champagne bubble test, staining the pulp chamber with 1% methylene blue, looking for bleeding signs, obliquely angled pre-operative radiographs can help in the detection of these canals (23).

Locating and treating additional canals is important for better prognosis and successful outcome of the treatment. Various studies have viewed the percentage of MB2 canals in maxillary second molars. Pecora *et al.* studied the internal anatomy of 370 maxillary molars by clearing the roof of the pulp chamber and located a second canal in mesiobuccal root of maxillary second molars, with frequency of 42% (24).

Stropko observed that by scheduling adequate clinical time, by using the recent magnification and detection instrumentation aids, and by having thorough knowledge of how and where to search for MB2, the incidence can approach 93% in maxillary first molars (25). Various aids used, particularly when used in combinations such as Dental operating microscope with selective dentin removal (dentin troughing) and Ultrasonics, drastically improved the identification of MB2 canals.

Conclusion

Prior knowledge of anatomic variations of the teeth before endodontic treatment can help dentists locate and treat all the canals. The percentage of MB2 canals in maxillary first molar derived in the present study was 36.49%. The intricacy in locating the MB2 canal can be reduced by using the additional technical and radiographic aids which in turn increases the success and prognosis of Endodontics in Maxillary molars.

Acknowledgement

We would like to extend our sincere gratitude to the Department of Conservative Dentistry and Endodontics, CKS Theja Institute of Dental Sciences and Research and Private Practitioners in Tirupathi, Andhra Pradesh, India for their support and providing their valuable information required in the study without whom this study would be incomplete.



Financial Support and Sponsorship

Nil.

Conflicts of Interest

There are no conflicts of interest.

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