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AN IN VITRO STUDY TO FIND THE INCIDENCE OF 2ND MESIOBUCCAL CANAL IN PERMANENT MAXILLARY FIRST MOLARS USING THREE DIFFERENT METHODS

Dentistry

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ABSTRACT

Aims: The aim of this study was to evaluate the incidence of MB2 canals using three different methods (CBCT, clinical analysis (naked eye), and dental microscope) and to compare the efficacy of the three methods in identifying the incidence of MB2 canals in the maxillary permanent first molars.**Methodology:** The study sample consisted of 20 extracted intact permanent maxillary first molar. The access opening was done and clinical analysis is done for MB2 canal later the extracted tooth seen under microscope to locate MB2 and then subjected to CBCT. **Results:** By applying Chi-square test there is a significant association between Incidence of Mesiobuccal 2 Canal in permanent maxillary first molar and three different methods (naked eye, microscope, and CBCT) and after applying Z test of difference between two proportions of Incidence of Mesiobuccal 2 Canal is significantly higher in method CBCT (40%) than method microscope (25%) and naked eye (15%).(p=0.0001) **Conclusion:** This study concluded that the incidence of MB2 canal detection was increased by the use of CBCT scans and dental microscope in comparison to naked eye.

KEYWORDS

Permanent Maxillary first molar, second mesiobuccal canal, access opening

INTRODUCTION

The primary goals of endodontic treatment is an adequate cleaning and shaping of all the pulp spaces and its complete filling with an inert material. The maxillary first molar shows the root canal anatomy with maximum complexity and variations.1 Because of this complexity, it has the highest failure rate in endodontic treatment, that often lead to a missed second canal in the mesiobuccal 2 (MB2) root, that remains undetected and therefore untreated.2 Previous clinical studies reported variation in distobuccal and palatal canals of maxillary molars. Particularly in the mesiobuccal root, very often a canal located in the lingual portion of such a root might not be located; this canal is known as the mesiolingual canal of the mesiobuccal root, mesiopalatal canal, or MB2 as a simplified name. The presence of such canals was first reported by Hess in 1925.3 The presence of the MB2 canal in maxillary first molars is said to range from 50% to 90% of cases. According to Cullied the incidence is 96.5%. Knowledge of the morphology of the root canal system, therefore, is extremely important in planning endodontic therapy, as its success relies on the location of all of the canals that can then be disinfected, shaped, and filled.4 Traditional means of determining its presence and location include clinical examination and conventional two-dimensional radiography. Conventional radiography, while an essential aspect of endodontic treatment, has several limitations that make it less than an ideal tool for locating MB2. Because periapical (PA) radiography shows only a two-dimensional image and the superposition of the subjacent anatomic structure with the cortical density.5 Other than intra-oral periapical radiography newer techniques has arrived like computed topography (CT), Cone beam computed topography (CBCT) and scanning electron microscopy. For identification of MB2 canal magnification plays the important role. Magnification helps the practitioner to view the pulp chamber floor and brings minute details into clear view.6 CBCT is a relatively recent innovation that overcomes many of the limitations of conventional radiography. It has many applications in endodontics because it's three-dimensional images allow inspection of the tooth in the axial, coronal, and sagittal planes.7 The purpose of this study is to evaluate the incidence of MB2 canals using three different methods (CBCT, clinical analysis and dental microscope and to compare the efficacy of the three methods in identifying the incidence of MB2 canals in the maxillary permanent first molars. This study may help clinician identifying, negotiating, and treating missed second canals in the permanent maxillary first molar for better prognosis.

METHODOLOGY

Twenty extracted intact permanent maxillary molars were collected from Department of Oral Surgery and private dental clinics. The collection, storage, sterilization, and handling of 20 extracted teeth were followed according to occupational safety and health administration and the Center for Disease Control and Prevention recommendations and guidelines. The teeth were cleaned of visible blood and gross debris. The teeth were stored in 1% thymol solution for 1 week. The teeth were kept in a well-constructed container with a secure lid to prevent leaking during transport. The container was labeled with biohazard symbol. The teeth were numbered from 1 to 20. Ten teeth were positioned and organized in a wax slab in a row. A gutta-percha cone was placed on the right side of the wax slab to identify in the CBCT image, later each slab was scanned with CBCT (Kodak, 9300c, U.S.A). The voxel of 0.2 mm was used with an exposure of 15 min. One endodontist, and one radiologist recorded the number of canals and their variations.[Figure 1].

An access cavity was prepared under halogen bulbs using #2 and #4 Endo Access bur (Maillefer, Dentsply, Switzerland). Initial penetration was made in the exact center of the mesial pit, with the bur directed toward the palatal using a high-speed handpiece to the depth of dentin. The bur was directed toward the orifice of the palatal canal. When a drop was felt, the pulp chamber was reached. The larger palatal canal was located first after which safe-ended #0152 Endo-Z bur (Maillefer, Dentsply, Switzerland) was used, keeping it in contact with the floor of the pulp chamber and moved mesiobuccally to the center of the MB cusp. The MB canal was explored beneath the cusp tip, and the bur was moved distally and slightly palatally to locate the distobuccal canal orifice. A conventional triangular access was modified to a trapezoidal shape to improve access to the additional canals. Final finishing and funneling of cavity walls was done with Endo-Z fissure bur. After an adequate access cavity preparation, the contents of the pulp chamber were removed using an endodontic excavator and subsequent irrigation with a 2.5% sodium hypochlorite solution. The pulp chamber floor was explored using an endodontic explorer, DG-16 (Maillefer, Dentsply, Switzerland). Exploration of groove connecting the canal orifice was performed with the use of K-files #6, #8,or #10 (Mani, Japan).

Identification of MB2 canals were done in 3 stages as following:

Stage 1: Teeth were checked with naked eye (clinical analysis) for second canal in the MB root with the help of explorer and then k-files #6 or #8, and ethylenediaminetetraacetic acid was used to negotiate

MB2 canal. If canal was not located by naked eye, samples will be subjected to stage 2.

Stage 2: Teeth failed to locate MB2 canal were examined with dental microscope 12.5* eyepiece magnification for the presence of MB2. If MB2 was located with or without magnification, Size 6, 8, and 10 k-file was inserted in MB and MB2 canals [Figure 3].

Stage 3 : After completing stage 1 and 2 The results were statistically analyzed byChi-square test, McNemar's test and Z test.

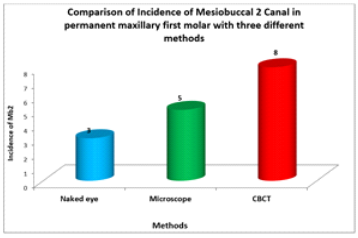

Figure 1. Comparison of incidence of MB2 canal in permanent maxillary first molar with three different methods

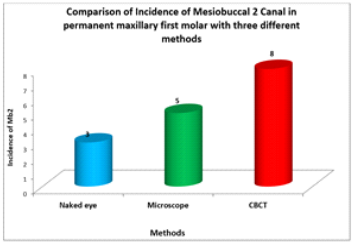

Figure 2. Comparison of incidence of MB2 canal in permanent maxillary first molar with three different methods

Figure 3. Detection of MB2 canal under dental microscope

Incidence of Mesiobuccal 2 Canal	Methods			Chi-square test
	Naked eye	Microscope	CBCT	
	No. (%)	No. (%)	No. (%)	Value of ^{2}= 7.323, p=0.0978, significant
Yes	3 (15.0%)	5 (25.0%)	8 (40.0%)	
No	17 (85.0%)	15 (75.0%)	12 (80.0%)	
Total	20	20	20	

3. RESULTS AND DISCUSSION

In the present study, 20 extracted teeth were subjected to naked eye, dental microscope and CBCT to find the incidence of MB2 canal and to evaluate the efficacy of these three methods in finding MB2 canal. With naked eye, it was found in 3/20 (15.0%), whereas in dental microscope, MB2 canal was located in 5/20 (25.0%) and in CBCT it was found in 8 (40.0%). This difference in frequency of locating MB2 canal with the help of naked eye, dental microscope, and CBCT is statistically significant (p=0.0978) [Table 1].

From the above table it is seen that with the help of CBCT and naked eye, 3 (75.0%) MB2 canals were located, 5 (12.5%) MB2 canals were observed in CBCT, but not in naked eye, and 19 (47.5%) MB2 canals were not located either in CBCT or naked eye whereas 3 (75.0%) MB2 canals were located both with naked eye and microscope. Two (5%) MB2 canals were located only in microscope but not with naked eye and 35 (87.5%) MB2 canals were not located either with naked eye or microscope. This difference in locating MB2 canal is statistically significant with CBCT.

The historical triad states that “debridement, disinfection, and obturation” are important for success of root canal (ex vivo), 95.63% (clinical results), and 95.45% (CBCT results). Michetti et al.8 compared CBCT reconstructions of root canal systems with histological sections.

Magnification has been found to increase the detection rate of MB2 canals from 17.2% with the naked eye to 62.5% with therapy,9 for which endodontist must have comprehensive knowledge about root canal morphology.

If there is failure in locating root canal, it may reduce the chances of treatment success and is one of the main reasons for the failure of root canal therapy. The present study highlights the importance of recent advancing techniques such as CBCT and the use of dental microscope for locating canals in determining the root canal morphologies in the maxillary first molar which are usually missed by naked eye in general practice. The first maxillary molar is presents with numerous anatomical variations such as number and disposition of the canals. Clinically, the MB root contains second MB canal, which can be identified and treated more than 70% of the time.10 CBCT is a newer diagnostic imaging modality used in endodontics. as it CBCT provides three dimensional images (3D in three orthogonal planes (axial, sagittal, and coronal).

CONCLUSION

In the present study, the detection of MB2 canal with naked eye was 15% and with the use of dental microscope the detection of MB2 canal increased up to 25%. This finding showed that magnification increases the clinical ability to locate canals is supportive with the result obtained by above studies.

This study concluded that the incidence of MB2 canal detection was increased by the use of CBCT scans and dental microscope in comparison to naked eye.

CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Vertucci FJ, Haddix JE, Britto LR. Tooth morphology and access cavity preparation. In: Cohen S, Hargreaves KM, editors. Pathways of the Pulp. 9th ed. St. Louis: Mosby Elsevier; 2006. p. 203.
2. Smadi L, Khraisat A. Detection of a second mesiobuccal canal in the mesiobuccal roots of maxillary first molar teeth. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007;103:e77-81.
3. Cleghorn BM, Christie WH, Dong CC. Root and root canal morphology of the human permanent maxillary first molar: A literature review. J Endod 2006;32:813-21.
4. Kulild JC, Peters DD. Incidence and configuration of canal systems in the mesiobuccal root of maxillary first and second molars. J Endod 1990;16:311-7.
5. Scarfe WC, Levin MD, Gane D, Farman AG. Use of CBCT in endodontics. Int J Dent 2009;2009:634567.
6. Michetti J, Maret D, Mallet JP, Diemer F. Validation of cone beam computed tomography as a tool to explore root canal anatomy. J Endod 2010;36:1187-90.
7. Gutmann JL. Problem Solving in Endodontics. 5th ed. St.Louis: Elsevier; 2011. p. 85-6.
8. Ruddle CJ. MB2 root canal systems in maxillary first molars. Dent Today 1995;14:38, 40-1.
9. Gutmann JL. Problem Solving in Endodontics. 5th ed. St.Louis: Elsevier; 2011. p. 85-6.
10. Ruddle CJ. MB2 root canal systems in maxillary first molars. Dent Today 1995;14:38, 40-1.