ORIGINAL ARTICLE

PATTERN OF ROOT CANALS IN MAXILLARY SECOND PREMOLARS

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ABSTRACT

Lack of knowledge of root form, internal morphology and critical interpretation of radiographs will undoubtedly lead to an error in obturation of root canals.

The aim and objective of this study was to clinically and radiographicaly determine the frequency of single and more canals in maxillary second premolars and to compare the clinical and demographic features by taking periapical radiography at two different angles among a sample of local population and also to investigate the gender variations.

Patients were recruited from regular pool of patients presenting to Dental department of PIMS, Islamabad, for root canal therapy on maxillary second premolars, during six month study period. Hundred male and female patients were selected according to the inclusion and exclusion criteria. Periapical radiographs through PT were taken at different angulations and visualized. Endodontic files were inserted into the canals through an access opening and a confirmatory radiograph was taken to confirm the numbers of root canals. The preoperative radiographs were correlated with the clinically assessed radiographs.

Among the hundred patients (n=57) 57% were males and (n=43) 43% were females. Clinically assessed radiographs showed that 65% had single root canals and 35% had multiple canals. There was no significant difference between characteristics of patients with maxillary second premolars presenting with single canal or multiple canals.

Key words: *Maxillary second premolar, Root canal morphology, Endodontic radiographs*

INTRODUCTION

In order to perform endodontic treatment skillfully and effectively, it is imperative for the dentist to know tooth anatomy clinically and radiographically. The identification of the internal morphology remains challenging during instrumentation due to the variability of the root canal system across different races. Radiographic assessment, tactile perception and clinical visualization with and without magnification are still commonly used clinical methods for determining number of root canals and their morphology. A lack of knowledge of root form, configuration of the pulp spaces and critical interpretation of radiographs can lead to an error in localization, instrumentation of root canals. The only way to detect root canal morphology and anatomy is the use of proper preoperative radiograph.[1]

Second maxillary premolar is among the most commonly endodontically treated teeth. Hull and coworkers found its frequency to be 10.3%.[2] Maxillary second premolar canal number variation has been reported to range from single canal till as many as four. The incidence of two canals at the apex is reported to range from 4 to 50%.[3] It is suggested that gender and ethnic origin may also influence the root canal morphology.[4]

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METHODOLOGY

A cross sectional study was conducted in dental department of Pakistan Institute of Medical Sciences, Islamabad. The study was conducted over a period of six months from the 30 July 2007 till 30 January 2008 after getting approval from the ethics review committee. Using a purposive sampling technique, hundred patients were selected from patient visiting the dental department for root canal treatment of maxillary second premolar.

Patients who were in age range of 13-50 years were included in this study. These patients required root canal treatment of maxillary second premolar due to pulpal pathosis like irreversible pulpitis, necrotic pulp or exposure due to fracture or elective endodontic treatment for restorative procedures. Cases requiring retreatment due to previous failed endodontic treatment were also included. Patients presenting sclerosed canals, root resorption, open apices were excluded in present study. Mentally and physically handicapped patients were also excluded. Informed consent were taken from the Patients included in the study.

Two diagnostic periapical radiographs (3 x 4 cm periapical film size, M-2 Comfort (Speed E, Agfa Dentus, Hanau, Germany) were taken of each patient, one with paralleling technique by using the EndoRay (Rinn Co) film holder and second radiograph with slight mesial agulation. This variation in radiographic technique was made by directing the central beam 20 to 30 degrees from the mesial (Walton's projection). This was evaluated using a magnifying lens and x-ray viewer. The number of canals was recorded in data sheet.

After administering local anesthesia and application of rubber dam, a round diamond bur was used for making adequate coronal access into the pulp chamber. The canals were located with the aid of DG 16 root canal explorer. ISO size 15 K files were inserted in the canals and a confirmatory radiograph through mesial shift technique (Walton's projection) was taken again. The preoperative radiographs were correlated with the clinical findings.

Data collected was entered in SPSS version 16. Mean ± standard deviation was calculated for age, and socioeconomic status. Frequencies and percentages were presented for number of identified canals. Chi-square test was used to compare gender variations and number of canals identified. $P<0.05$ was taken as significant

RESULTS

In present study of total 100 subjects the mean age of study patients was 28.1 $\pm$ 7.1 years, ranging from 15-41 years. A trend of increasing need for endodontic treatment of second premolar was seen across different age groups 17 (17.0%) were below 20 years of age, 39 (39.0%) were in their 3rd decade of life, 43 (43.0%) were in the 4th decade of life. Forty three (43.0%) patients were females while 57 (57.0%) were males in present study (Table 1). The patients were mostly from lower socioeconomic class (n=76, 76%) with monthly income less than Rs. 10,000.

The most common presentation n=65 (65.0%) of root canals were single canal pattern in this sample, while in the rest of n=35 (35.0%) cases two canals were found (Table 2).

Out of the one canal group n=65, eight subjects (21.3%) were below 20 years of age, n=28 (43.1%) were in the 3rd decade of life, another 28 (43.1%) were in 4th decade and only one (1.5%) was in the 5th decade of life. Similarly in two canal group of 35 cases, nine (25.7%) were below 20 years, 11 (31.4%) were in 3rd decade of life, 15 (42.9%) were in 4th decade of life and no one was in the 5th decade of life. On analysis for association

TABLE 1: CHARACTERISTICS OF STUDY PATIENTS (n=100)

Variable	Number	%age
Age groups		
< 20	17	17.0%
20 – 29	39	39.0%
30 – 39	43	43.0%
40 and above	01	1.0%
Socioeconomic status		
Lower (< 10000)	76	76.0%
Middle (10000 – 20000)	18	18.0%
Upper (> 20000)	06	6.0%
Gender		
Male	57	57%
Female	43	43%

TABLE 2: DISTRIBUTION OF NUMBERS OF CANALS DETECTED CLINICALLY AND RADIOGRAPHICALLY (n=100)

Canals	Number	%age
One	65	65.0%
Two	35	35.0%

TABLE 3: COMPARISON OF NUMBER OF CANALS AND CHARACTERISTICS OF STUDIED SUBJECTS (n=100)

Variable	One Canal (n=65)	Two Canals (n=35)	p-value
Age categories (years)			
< 20	08 (12.3%)	09 (25.7%)	0.29
20 – 29	28 (43.1%)	11 (31.4%)	
30 – 39	28(43.1%)	15 (42.9%)	
40 and above	01 (1.5%)	Nil (0.0%)	
Gender distribution			
Male	35 (53.8%)	22 (62.9%)	0.38
Female	30 (46.2%)	13 (37.1%)	

between age and number of canals, no statistical significant difference was determined (Table 3).

Gender distribution of patients across different types of canal morphology was also determined which showed that out of the n=65 patients presenting with single canal, 53.8% (n=35) were males and 46.2% (n=30) were females. Where as in patients presenting with two canals n=22 (62.9%) were males while 13 (37.1%) were females. The difference between gender of the patients and number of canals done was found to be statistically non-significant (Table 3).

DISCUSSION

Radiographs are helpful for the visualization of root anatomy, but these techniques do not allow for the observation of external and internal anatomy of teeth in three dimensions.[5,6] Therefore, accurate knowledge of root anatomy is an important ally to radiographic resources along with tactile sense and operator's clinical experience.

This study shows that out of hundred patients included 65% had single canals and 35% had two canals. A similar pattern of root canals was reported in Pecora, Green and Vertucci who reported presence of single canals in 67.5%, 72% and 75% of cases respectively.[7,8,9] The result of the present study is in variance with earlier study by Bellizi and Chima in which maxillary second premolars had two root canals in 58% and 71.5% respectively.[10,11] Khurram conducted a study in Karachi (Pakistan) and reported an incidence of single canals in 43% and two canals in 57% of the maxillary second premolar teeth.[12]

There are few studies which suggest that root canal morphology may also be influenced by gender.[13] Studies by Georgopoulou, Wayman, reported a poor association of canal patterns and gender.[2,14,15] Opposite results were found by Kirkevang et al and Gulsah in their studies on different type of teeth.[16,17]

Difference of results may reflect variations in sampling and methods in study technique. Several studies examined the macromorphology of root canals in permanent teeth using different methods of analysis.[18-21] In the study of the morphological characteristics of root canal systems, conventional vivo methods have been informative; however, they cause irreversible changes to the samples.

Radiographic techniques also have been used to obtain a two dimensional image.[10, 22] Some of the techniques are complicated, time-consuming and many difficulties can be encountered during their execution, introducing artifacts and distortion of the internal anatomy of the tooth. Cone beam computed tomography is a promising development for determining three dimensional root canal morphology, but currently its implications for endodontics clinically remains limited due to high cost and availability.

Studies on the internal and external anatomy of teeth have shown that anatomical variations can occur in each group of teeth, in each person, and racial groups. Due to the racial diversity among the patients, the dentist must possess a sound knowledge of racial anatomical variations.

CONCLUSION

Present study showed that there is a high frequency of single canal in both male and female groups and incidence of multiple canals is not gender dependant, and there is no difference in clinical-demographic features of cases with one or more than one canal.

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