

FREQUENCY OF TWO CANALS IN MAXILLARY SECOND PREMOLAR TOOTH

Khurram P. Sardar, Nadeem H. Khokhar and M. Irfanullah Siddiqui

ABSTRACT

Objective: To determine the frequency of two canals in relation to age and gender as well as role of shift cone angle radiographic technique in maxillary second premolar tooth.

Design: A cross-sectional study.

Place and Duration of Study: The study was conducted in Operative Department (Endodontic Department), Hamdard University Dental Hospital, Karachi, from January 2004 to February 2005.

Patients and Methods: One hundred and twenty patients were selected for the study, based on non-probability purposive sampling technique. Twenty patients were dropped out of the study and the data was analyzed for 100 patients. All patients were examined clinically as well as radiographically. Then the canals were opened to further confirm and treat the tooth. The findings were noted on a performa and then cross-tabbed for the significant difference.

Results: One hundred patients {43 males (43%) and 57 females (57%)} whose mean age was 36.2 (SD±7.3) were treated. Forty (40) years was the age limit for dividing the patients into two groups. Out of 43 males, 27 (63%) were below 40 years and out of 57 females, 38 (67%) were below 40 years. Statistical analysis with Chi-square revealed no significant difference. Out of 43 males, 27 (63%) had two canals and out of 57 females, 30 (53%) had two canals with no significant difference between the two groups. Results of parallel X-ray were cross tabbed with shift cone angle technique and the difference was highly significant (Chi-square value 9.61 and p-value 0.002).

Conclusion: Frequency of two canals was high is not age or gender dependant. Shift cone angle technique should be used as radiographic support for the clinical examination to identify the number of canals. The second canal became apparent with shift cone technique in 78% cases where additional periapical radiographs with shift cone angle technique were taken.

KEY WORDS: Maxillary second premolar tooth. Root canal treatment. Frequency of canals.

INTRODUCTION

Second maxillary premolar is among the most commonly endodontically treated teeth¹. Hull and co-workers in 2003 found its frequency to be 10.3%.¹ Usually, the number of canals in maxillary second premolar is one.^{2,3} However, there is enough evidence in the published literature about the presence of second^{4,6} and third canal.^{4,7} Pecora and co-worker reported that out of 435 maxillary second premolars studied, 67.3% had two canals.⁵ The incidence of two canals at the apex is reported to range from 4 to 50%.⁸⁻¹⁰ Although not specifically stated, these figures appear to relate to teeth of Caucasoid origin.^{1,5} Kartal, Ozcelik and Cimilli¹¹, in their study of 300 extracted maxillary second premolars reported an incidence of 48.66% for one canal, 50.64% for two canals and 0.66% for three canals at the apex.

The clinical examination¹² should be supported by the radiographic examination in order to determine root canal anatomy, number and position of the roots as well as their

relative length, attaining efficient, accurate access to the pulp chamber and orifices. A pre-operative working length and postoperative periapical radiographs, known as Kaufman technique, had been advocated^{13,14} to minimize the risk of perforation and prevent complications.² In addition, Kaufman¹⁴ advocated the use of shift cone angle technique to identify superimposed roots, overlapping and unidentified canals¹⁴ thereby minimizing the risk of post-obturation pain and treatment failure.¹⁵⁻¹⁷

Though the implications of root form and root canal morphology on clinical endodontic have been fully established in western literature, the features of root canal morphology in Asian settings have not been documented. The aim of this study was, therefore, to find out the frequency of two canals in maxillary second premolar at Hamdard University Dental Hospital, and determine the most appropriate radiographic technique to count the number of canal to avoid complications and failure in root canal treatment.

PATIENTS AND METHODS

This was a cross-sectional study conducted in Endodontic Department of Hamdard University Dental Hospital, Karachi, between January 2004 to February 2005.

During the study period, 120 patients, 25 to 50 years old, seeking treatment of maxillary second premolar diagnosed on the basis of clinical signs and symptoms of irreversible pulpitis or necrosis were included in this study adapting non-probability purposive sampling technique. A diagnostic

Department of Oral and Maxillofacial Surgery, Hamdard University Dental Hospital, Karachi.

*Department of Operative Dentistry, Hamdard University Dental Hospital, Karachi.

**Department of Community Health Sciences, Hamdard University Dental Hospital, Karachi.

Correspondence: Dr. Khurram P. Sardar, A-342, Block I, Gulshan-e-Iqbal, Karachi-75300. E-mail: dr-khurramparvez@hotmail.com

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radiograph was taken for each patient to verify the involvement of pulp, or presence of periapical pathology. The patient having internal root resorption, root fracture, mobility (grade III) and any teeth other than maxillary second premolar were excluded from the study. Out of 120 patients, selected for the study, 20 patients dropped out of the study due to incomplete information, discontinuation of treatment or other complications.

All the patients fulfilling inclusion criteria were first examined clinically by pulp chamber opening for the number of canals (Figure 1) followed by periapical radiographic confirmation with parallel angle technique in horizontal plane and horizontal angle 45 degree (Figure 2). Additional periapical radiograph at shift cone angle technique was taken in few cases when there was doubt of presence of second canal (Figure 3). The findings were noted on a performa and then cross-tabbed for the significant difference.

The data was entered in SPSS 10 and proportion of two canals was calculated. Chi-square was applied to find out the difference according to age, gender and radiographic angulations.

RESULTS



Figure 1: Clinical findings after opening the chamber (arrow showing canal orifice).

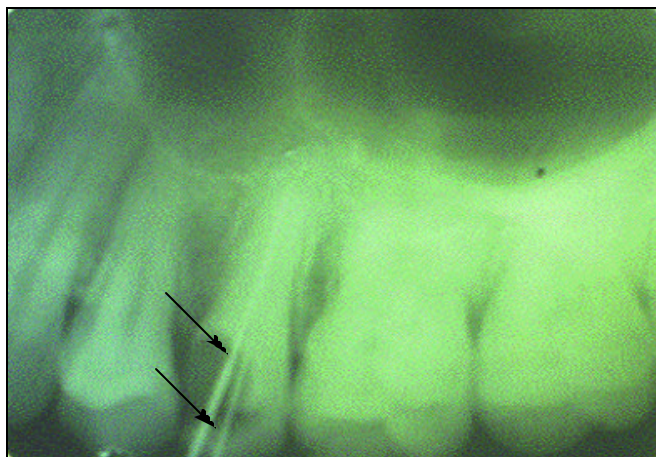


Figure 2: Radiograph with shift cone angle technique (arrows showing files indicating the exact position of the canals).

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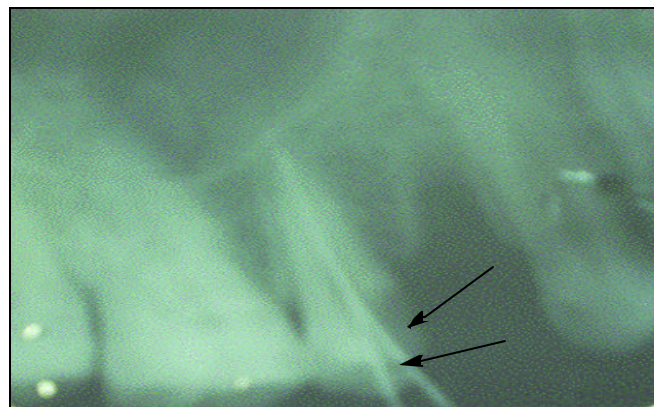


Figure 3: Radiograph with parallel angle technique (arrows showing 2 files overlapping each other).

One hundred and twenty patients, 25 to 50 years old, seeking treatment of maxillary second premolar, diagnosed on the basis of clinical signs and symptoms and radiographs were included in this study. Twenty (20) patients were dropped out of the study due to incomplete information, discontinuation of treatment or other complications and the data was analyzed for 100 patients.

One hundred patients {43 males (43%) and 57 females (57%)} whose mean age was 36.2 (SD \pm 7.3) were treated. Forty (40) years was the age limit for dividing the patients into two groups. Out of 43 males, 27 (63%) were below 40 years and out of 57 females, 38 (67%) were below 40 years. Statistical analysis with Chi-square revealed no significant difference. Out of 43 males, 27 (63%) had two canals and out of 57 females, 30 (53%) had two canals with no significant difference between the two groups.

Results of parallel X-ray were cross-tabbed with shift cone angle technique, the results were highly significant (Chi-square value 9.61 and p-value 0.002, Table I)

Table I: Distribution of radiographic technique by interpretation.

Radiographic technique	Clear interpretation	Doubtful	Total
Shift cone angle technique	29	08	37
Parallel X-ray technique	28	35	63
Total	57	43	100

DISCUSSION

The fact that the dentist should have adequate knowledge of the root and canal morphology of teeth requiring endodontic treatment cannot be overemphasized. Maxillary second premolar are generally considered to have one canal, in the present study, this tooth had two canals in 57% of cases. This is at variance with the studies of Green¹⁸ and Vertucci et al.¹⁹ in which the maxillary second premolars was reported to have one canal in 72% and 75% of cases respectively. The result of this study is in support of an earlier study of Chima²⁰ and Pecora⁵ in which maxillary second premolars had two root canals in 71.5% and 67% of cases respectively. These studies were aimed to check the distribution with type of canals. This was, however, not investigated and is the limitation of the study.

Periapical radiography is the basic diagnostic tool for endodontic procedures. In the present study, Kaufmann technique of radiography was followed since it was widely used and accepted in endodontic studies.²¹ However, in clinical practice, it may be difficult to always identify the morphological variations on periapical radiograph, the radiograph shows only a two-dimensional image of a three-dimensional object. However, additional periapical radiographs taken at shift cone angulations to initial diagnostic radiograph will reveal adequate information about the number of root canals.

Interestingly, it was found that parallel X-ray technique could differentiate only 44% cases with two canals whereas shift cone angle technique was able to differentiate 78% cases. The result of this study also support Green¹⁸ and Serti.²²

Pineda Kutler¹⁰ had correlated canal morphology with root curvature. Root curvature, however, was not investigated as it requires scanning electron microscopy and is another limitation of this study. At present, there is no local data on the frequency of two canals in maxillary second premolars from our country.

It was found that 63% males and 53% females had two canals. The result, however, was statistically not significant. This result matches with Hull and co-workers¹ and Wayman,²³ Opposite results were found by Molven and co-worker²⁴ and Kirkevang et al.²⁵ but their studies were not specifically for maxillary second premolar tooth and this might be the reason for the opposite result.

Forty (40) years was the age limit for dividing the patients into two groups and they were selected based on the studies of Bjorndal²⁶, Saad²⁷ and Molven.²⁴ Based on the age distribution, it was noted that most of the people, seeking treatment, were below 40 years^{17,24,25} but there was no statistically significant difference between age and frequency of the canal. The results are in agreement with the other studies done by Hull and co-workers¹ and Brunelle and co-workers.²⁸

CONCLUSION

Frequency of two canals was high, not age or gender dependant. Shift cone angle technique should be used as radiographic support for the clinical examination to identify the number of canals. The second canal became apparent with shift cone technique in 78% cases where additional periapical radiographs with shift cone angle technique were taken.

Multicentre studies should be conducted to be able to accommodate the variation among various population of Pakistan.

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