ORIGINAL ARTICLE

RADIOGRAPHIC AND CLINICAL ASSESSMENT OF TWO CANALS IN THE MAXILLARY SECOND PREMOLAR

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Background: The second premolar is one of the teeth which are crucial both aesthetically as well as functionally and one of the most commonly endodontically treated tooth. Aim of the study was to assess the number of canals in maxillary second premolar by clinical and radiographic evaluation in Pakistani sub population. It was a cross sectional study conducted in Endodontic Department of Rehmat Memorial Dental Teaching Hospital, Abbottabad, from January 2019 to January 2020. **Method:** One hundred and five patients were selected for the study, based on non-probability sampling technique. All patients were examined clinically by exploration of pulp chamber followed by intra oral peri-apical radiograph to verify the clinical exploration of canals. **Result:** One hundred and five patients (46 males (43.8%) and 59 females (56.2%)} were selected for the study. Out of total 105 patients 47 (44.8%) had one canal and 58 (55.2%) had two canals. Out of 46 males 25 (54.3%) had two canals and out of 59 females 33 (56.9%) had two canals. Statistical analysis showed no significant difference (p=0.1871) of canals arrangements between genders. **Conclusion:** Clinicians should be careful whenever doing root canal treatment of maxillary second premolars because of the extreme variability of the anatomy of those teeth, there is always risk of missing the second canal. Frequency of two canals was high, which is not age or gender dependant.

Keywords: Endodontic; Periapical radiograph; Dental anatomy

Citation: Aslam N, Asif M, Nadeem A, Qureshi A, Tayyaba S, Mahmood T. Radiographic and clinical assessment of two canals in the maxillary second premolar. J Ayub Med Coll Abbottabad 2021;33(Suppl. 1):734–7.

INTRODUCTION

The second premolar is one of the teeth which are crucial both aesthetically as well as functionally and one of the most commonly endodontically treated tooth. In 2003, Hull and his co-workers found that second premolars requiring endodontic was 10.3%.[1] To perform a satisfactory endodontic treatment the dentist must have knowledge of the root and canal variations of teeth. Along with the third and second molars the second premolars also have been reported with very complex and variable internal anatomy. It has been reported in literature that all the Vertucci variations can be found in mandibular second premolar. The maxillary premolars comparatively show less variations and in most cases, the upper second premolars have a single canal.[2,3] However, according to the literature, the second maxillary premolars can show variations in the number of canals, i.e., it may contain two canals[4,6] and even three canals.[4,7] Pecora and a co-worker reported that of the 435 upper second premolars studied, 67.3% had two canals.[5] The incidence of two canals at the apex is reported to be in the range of 4–50% globally. This supports the fact that these variations may be geographically population related.[8–10]

Over the years multiple methods have been used to assess tooth root morphology. The two most common methods include in vivo and in vitro. In vivo method can be assessed by clinical assessment, conventional periapical radiography and advance techniques such as cone beam computed topography (CBCT). While in vitro there are staining and sectioning of roots and observation under microscopes or the use of the latest microcomputed tomography.[2–4,9] A clinical examination should complement radiographic assessment. That is why during conventional endodontics it is protocol to perform pre-operative, working length and post-operative periapical radiographs to determine the accurate root and canal number alongside length.[11] A Kaufman technique was recommended to minimize the risk of perforation and prevent complications.[12] In this technique Kaufman advocated the use of the displacement cone angle technique to identify superimposed roots, overlapping and unidentified canals, thus minimizing risk of post-obturation pain and treatment failure.[13–16]

The implication of root number and morphology as well as the number of root canals for any given tooth to perform endodontic has been established in the literature, but its effect in the Asian population, especially in Pakistan, has not been documented sufficiently. The objective of this study

was to establish some baseline data on the frequency of two canals in maxillary premolar teeth. So, the endodontist has some data to correlate for his evidence-based practice. Hence avoiding complication and to minimize the failure of root canal treatment in the maxillary second premolar.

MATERIAL AND METHOD

This was a cross-sectional study conducted at Endodontic Department of Rehmat Memorial Dental Teaching Hospital, Abbottabad, from January 2019 to January 2020.

During the study period, one hundred and five patients, seeking treatment of second maxillary premolar diagnosed on the basis of clinical signs and symptoms of irreversible pulpitis or necrosis, were included in this study, adopting non probability consecutive sampling technique. A diagnostic digital radiograph was taken for each patient with paralleling technique and Scaned with Digora, to verify the involvement of the pulp or the presence of periapical pathology. Those patients aged over 60 years and whose teeth showed internal root resorption, root fracture, mobility (grade III) and the disable people were excluded from the study.

After evaluating the preoperative radiograph of all patients who met the inclusion criteria, the teeth were examined clinically by opening the pulp chamber to determine the number of canals followed by two periapical digital radiographs one with 90 degree and second with distal shift, with paralleling technique and scanned with Digora, to verify the clinical exploration of the canals. All teeth were explored clinically with naked eyes by two 4th year post graduate residents of FCPS-II in operative dentistry and endodontics.

The data were entered in SPSS 20 and the proportion of two canals was calculated. Post stratification chi-square test at a significance level of ≤0.05was used.

RESULTS

One hundred and five patients, seeking treatment of second maxillary premolar diagnosed on the basis of clinical signs and symptoms of irreversible pulpitis or necrosis, were included in this study.

One hundred and five patients {(46 males (43.8%) and 59 females (56.2%)} were included as shown in table-1. Out of total 105 patients 47 (44.8%) had one canal and 58 (55.2%) had two canals as shown in table-2.

Out of 46 males 25 (54.3%) had two canals and out of 59 females 33 (56.9%) had two canals. Statistical analysis showed no significant difference (p=0.1871) in frequency distribution of canals with respect to gender of two canals between genders, as shown in table-3.

Table-1: Frequency of gender of the patients

	Frequency	Percent
Male	46	43.8
Female	59	56.2
Total	105	100.0

Table-2: Frequency of canals

	Frequency	Percent
One canal	47	44.8
Two canals	58	55.2
Total	105	100.0

Table-3: Frequency distribution of canals with respect to gender:

Canals	Gender		Total	*p*-value
	Male	Female		
One canal	21	26	47	0.871
	44.7%	55.3%	100.0%	
Two canals	25	33	58	
	54.3%	56.9%	100.0%	
Total	46	59	105	
	43.8%	56.2%	100.0%	

DISCUSSION

It cannot be overemphasized that the dentist must have sufficient knowledge of the morphology of the root and canal of the teeth requiring endodontic treatment. The second maxillary premolar is generally considered to have a single canal. In this study, this tooth had two canals in 55.2% of cases. This is in contradiction with the studies of Green[17] and Vertucci *et al*.[18] in which it was reported that maxillary second premolars had one canal in 72% and 75% of cases respectively. The result of this study is in favour of an earlier study on Chima[19] and Pecora[5] in which the maxillary second premolars had two root canals in 71.5% and 67% of cases respectively. These studies aimed to verify the distribution with the type of canals.

Periapical radiography is the basic diagnostic tool for endodontic procedures but due to its two-dimensional limitation sometime can be misleading and its role is debatable. In the present study, the Kaufmann radiography technique was followed since it was widely used and accepted in endodontic studies.[20] However, in clinical practice, it may be difficult to always identify the morphological variations in periapical radiography, the radiograph shows only Two-dimensional image of a three-dimensional object. However, additional periapical radiographs taken at the cone angles of change to the initial diagnostic radiograph will reveal adequate information on the number of root canals.

Pineda Kutler[10] had correlated the morphology of the canal with the curvature of the root. The curvature of the root, however, was not investigated, since it requires scanning electron microscopy and is another limitation of this study. Currently, there are very limited local data on the frequency of two canals in the second upper premolars in our population.

It was found that 54.34% males and 55.93% females had two canals. The result, however, was not statistically significant at p=0.871. This result coincides with Hull and coworkers[1] and Wayman,[22] Molven and coworker[23] and Kirkevang *et al*.[24] found opposite results, but their studies were not specifically for the maxillary second premolar which could be the reason for variable result.

It should be considered that ethnicity has influence on dental morphology.[25,26] On the bases of ethnicity variations in the root canal morphology has been shown by studies of Julia Yen Yee Pan[27] 46.5% had two canals in Malaysian subpopulation, Martins *et al*.[28] and Kartal *et al*. also recorded similar incidence in the Asian subpopulation and Turkish population while Weng *et al*.[29] recorded 72.3% of two root canals in second premolars in the Chinese population. The finding of this study was almost similar to the study of Zaatar EI[30] in Kuwaiti population and Sardar KP[31] in Pakistani population.

Although our study has shown that maxillary second premolars have two canals in 55.2% cases but still it has some limitations. We did not use any magnifying aid. All the cases were clinically explored by 4th year residents not by experienced clinician. They are explored by two different residents their individual experience may be different. Therefore, we feel that the frequency of two canals in maxillary second premolars need further research with modern and magnifying aids to established more reliable and accurate data.

CONCLUSION

Clinicians should be careful whenever doing root canal treatment of maxillary second premolars because of the extreme variability of the anatomy of those teeth, there is always risk of missing the second canal.

Frequency of two canals was high, which was not age or gender dependant.

AUTHORS' CONTRIBUTION

NA: Literature search, conducted study, Data collection, write manuscript, result interpretation. MA: Data collection. AN: Literature search. AQ: Statistic and data analysis. ST: Literature search. TM: Statistic and data analysis

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Submitted: September 14, 2020	*Revised: October 14, 2020*	*Accepted: February 14, 2021*

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