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ROOT CANAL MORPHOLOGY OF MAXILLARY FIRST AND SECOND PREMOLAR USING CONE BEAM COMPUTED TOMOGRAPHY IN SOUTH INDIAN POPULATION

B.Vijayalakshmi, Dr.S.Pradeep

IV Year BDS, Saveetha Dental College, Poonamallee High Road, Chennai.

Senior Lecturer, Saveetha Dental College, Chennai.

Email: vijinov2@gmail.com

Received on 15-01-2016

Accepted on 15-02-2016

Abstract

Aim: To assess the morphology of maxillary first and second premolars using cone beam computed tomography.

Material and Methods: In this cross sectional study, conducted in Department of Conservative Dentistry and Endodontics, Saveetha University. 50 CBCT scans were collected and evaluated out of 92 from various centres. The following data were analyzed: number of roots, canals and its variations of maxillary first and second premolars. Data obtained were analysed with SPSS 20.0 for the occurrence of canal variations.

Result: In this study, all the maxillary first and second premolars were assessed. The root pattern were categorized based on Vertucci's Classification, for maxillary first premolars Type I (7%); Type II (17%); Type III (5%); Type IV (59%); Type V (7%); Type VI (3%); Type VII (1%), one tooth had 3 roots with 3 canals (1%). The maxillary second premolars Type I (51%); Type II (22%); Type III (3%); Type IV (9%); Type V (15%); no Type VI and VII were observed.

Conclusion: In this study the maxillary first premolar had more Type IV canal anatomy, there was only one tooth with three rooted was recorded. In Maxillary Second Premolar Type I pattern had higher predilections.

Keywords: Root canal anatomy, CBCT, Maxillary premolars, Root canal variations

Introduction

The success of the root canal anatomy depends upon numerous factors like: number of canals, internal anatomy, instrumentation techniques, disinfection protocols and three dimensional filling. Studies showed that root canal failures are more likely to occur because of missed canals or unable to locate extra canals (1).

Before initiating the root canal treatment, the dentist ought to routinely take two or three radiographs, each at a different angle, to have a proper knowledge about the teeth.

The internal anatomy of maxillary premolars is complex due to their variations in number of root and its canal anatomy. Several researchers have reported a low incidence of maxillary premolars with single canal (Okumura et al 1927, Green et al 1973, Walker et al 1987) (2-4). The presence of 3 canals in the first premolars is quite low; 3 % found by Bellizzi et al 1985 (5). The internal anatomy of maxillary second premolars the incidence of having one canal is 81.8% by Kuttler et al 1972 (6), 67.3% by Pecora et al 1992 (7). The presence of 3 canals was found to be 1.1% reported by Bellizzi et al 1985 (5).

Two dimensional imaging techniques have been used since the first dental intraoral radiographs were taken in 1896. Cone beam computed tomography (CBCT) imaging is one of the recent techniques that can able to visualize the object in an equal planes three dimensionally, with low cost and lower dose compared with conventional CT. The rationale behind this cross sectional study using CBCT is to determine the root canal morphology so that it has sub-millimeter resolution, three-dimensional image reconstruction, removal of superimposed structures and showing normal anatomy and morphology of the root canal system without additional exposure. CBCT provides images of root morphology with higher resolution than those obtained by conventional peri-apical radiography. Kim et al 2002 (8) reported that CBCT scans can enhance the understanding of the root canal anatomy, with the potential of improving the success in finding the root canal variations, which enhances the outcome of endodontic treatment. The objective of the present study is to see the possible occurrence and variations of root canal morphology in maxillary first and second premolars using cone beam computed tomography in south Indian population.

Materials and Methods

CBCT's 50 out of 92 patients were screened from the data collected from various centers was taken for the purpose of implant placement, aberrant bone and root canal anatomy, location of impacted teeth before orthodontic treatment were assessed. The inclusion criteria: age (15-45), bilateral premolar presence, non carious teeth. The exclusion criterias are: pathological lesions on premolars, congenitally missing premolars, developmental disorders, unilateral extracted permolars and endodontically treated. Based on the inclusion and exclusion criteria 50 patients CBCT were selected (25 males and 25 females). 100 maxillary first premolar and 100 maxillary second premolars were analyzed. The number of

root canals was examined and root canal system configurations were evaluated. In this study, the number of canals and canal types of maxillary first and second premolars were analyzed in axial, coronal and sagittal planes. In this study, canal morphology was determined based on Vertucci's classification. The predilections of each variation were noted and tabulated.

Results: Maxillary first premolars Type I (7%); Type II (17%); Type III (5%); Type IV (59%); Type V (7%); Type VI (3%); Type VII (1%), one tooth had 3 roots with 3 canals(1%). Maxillary second premolars Type I (51%); Type II (22%); Type III (3%); Type IV (9%); Type V (15%); no Type VI and VII were observed.

Table-1: Demographic data.

SEX	NUMBER OF PATIENTS	MAXILLARY FIRST PREMOLAR	MAXILLARY SECOND PREMOLAR
Males	25	50	50
Females	25	50	50

Table-2: Maxillary First Premolars.

Vertucci classification	Males		Females	
	Number	%	Number	%
Type 1	4	8	3	6
Type 2	10	20	7	14
Type 3	2	4	3	6
Type 4	28	56	31	62
Type 5	3	6	4	8
Type 6	1	2	2	4
Type 7	1	2	0	-
3 roots	1	2	-	-

Table-3: Maxillary Second Premolars.

Vertucci classification	Males		Females	
	Number	%	Number	%
Type 1	24	48	27	54
Type 2	12	24	10	20
Type 3	2	04	1	02
Type 4	5	10	4	08
Type 5	7	14	8	16
Type 6	0	-	0	-
Type 7	0	-	0	-

Discussion

The foremost goal of endodontic treatment is to save the tooth through a root canal procedure, chemical and mechanical cleaning and filling it with a filling material. However, failure is observed in root canal therapy; one of the main reasons for failure is low knowledge about root canal anatomy, variations in the number of canals. Proper knowledge about the root canal morphology decreases all these errors there by enhances the success rate (9-11).

In this study based on 50 CBCT reports (25 male and 25 female) of patients showing canal variation in maxillary first and second premolars with all those exclusion and inclusion criteria. Our study revealed that more or less equal prevalence of canal variation in males and females. Based on the Vertucci classification of canal variation, Table 2 shows the maxillary first premolar had more Type IV (59%) canal anatomy, there was only one tooth with three rooted was recorded. Table 3 shows that in Maxillary Second Premolar Type I pattern (51%) had higher predilections. The advantages of CBCT is that we can able to assess the root canal configuration more clearly compared to conventional digital x-rays, the planes are of equal dimensions (X,Y,Z) isometric, unlike CT which is an-isometric.

The maxillary premolars, without a doubt, are among the most difficult teeth to be treated endodontically for various reasons; the number of roots, number of canals, the direction and longitudinal depressions of the roots, the various pulp cavity configurations, and also the difficulty in visualizing the apical limit by radiographs.

Krekes and tronstad et al 1961 showed that these teeth has to be instrumented based on the morphology of each root due to its variations in the apical limit (12).

Conclusion

The study of internal anatomy is always interesting because the variations found help us to elucidate the problems in endodontics. In our research we have found

1. Maxillary first premolar had more Type IV (59%) canal anatomy, there was only one tooth with three rooted was recorded.
2. Maxillary Second Premolar Type I pattern (51%).

Hence to conclude CBCT scans has been proved to be an effective tool in assessing the root canal variations. One can achieve a high success rate in treatment by using this three dimensional technique.

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Corresponding Author:

B.Vijayalakshmi*,

[Email:vijinov2@gmail.com](mailto:vijinov2@gmail.com)