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Research Article

CROWN ROOT ANGULATION OF MANDIBULAR PREMOLARS USING CBCT

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A R T I C L E I N F O

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A B S T R A C T

Aim: the aim of this research was to find the crown root angulation of madibular premolars using CBCT.
Materials and methods: 68 CBCT scans were collected from Saveetha dental college, Chennai. The crown root angulation of the madibular molars were measured from these CBCT scans.
Results: The mean angle of mandibular first premolar was in 46.80 male and 57.30 in female. The mean angle of mandibular second premolar was in male 46.80 and 57.30 in female.
Conclusion: It is important to know the crown root angulation to prevent deviated access opening and perforation of the canal. It also helps in reducing the fatigue of the instruments during cleaning and shaping of the root canals.

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INTRODUCTION

Cone beam computed tomography is a of X-raycomputedtomography where the X-rays are divergent, forming a cone.[1] CBCT has become increasingly important in treatment planning and diagnosis in dentistry. Perhaps because of the increased access to such technology, CBCT scanners are now finding many uses such as in the fields of endodontics and orthodontics. CBCT scanners are based on volumetric tomography, using a 2D extended digital array providing an area detector. This is combined with a 3D x-ray beam. The cone beam technique involves a 360 degree scan in which the x-ray source and a reciprocating area detector synchronously move around the patient's head, which is stabilised with a head holder.[2,3] The X-ray source and detector rotate around a fixed fulcrum within the region of interest (ROI). During the exposure sequence hundreds of planar projection images are acquired of the field of view (FOV) in an arc of at least 180°. In this single rotation, CBCT provides precise, essentially immediate and accurate 3D radiographic images. [4,5,6,7,8]

The dental crown of the lower first premolar is quite unusual, so much that it is considered a transitional form between the canine and the second premolar. The two cusps of the tooth are quite asymmetric, the buccal one being more pronounced while the lingual cusp is just evident. It could almost be considered a canine with a large cingulum. The pulp chamber, which is ovoid and directed buccolingually, lies almost entirely below the buccal cusp, thus, 90% of the access cavity, which is elliptical, must be created at the expense of the buccal cusp. This tooth has fewer variants as compared to the first premolar. The lingual cusp is better developed, and the tooth is more symmetrical. Vertucci [4] found that the lower second premolar has a single root with a single ovoid or round canal in 97.5% and a canal that bifurcates at the apex in 2.5%. Other times the canal can trifurcate.The crowns of all the posterior teeth are tipped distally to the long axis of the roots. Thus, there is a need to find to the crown root angulation of mandibular premolars for identifying the root canal position.

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MATERIALS AND METHODS

68 CBCT scans were collected from the radiology department of Saveetha Dental College, Chennai. From the 68 CBCT scans, 50 were selected in which 25 belonged to male and 25 belonged to female. The sample size was 50 first premolars and 50 second premolars in male and 50 first premolars and 50 second premolars in female.

Inclusion criteria

- CBCTs with class 1 occlusion without any crowding and spacing were only selected.
- Age 18-30 years
- Teeth with completed root formation were only included
- No carious/ traumatic teeth were included
- Pictures of mandibular premolars were taken from CBCT scan and printed out. A line was drawn from the apex of the premolar through the pulp horn and another line was drawn from the central pit through the CEJ. (Refer figure 1 and 2)

Exclusion criteria

- CBCT's with crowding and spacing were excluded
- Age above 30 years were excluded.
- Teeth without complete root formation were excluded
- Carious and traumatic teeth were excluded

RESULTS

Table 1

	Groups	Mean ± S.D	Independent t test
FIRST PREMOLAR	Males	46.80 ± 4.91	p(0.07)
	Females	57.30 ± 4.08	
SECOND PREMOLAR	Males	53.45 ± 6.57	p(0.25)
	Females	57.75 ± 5.91	

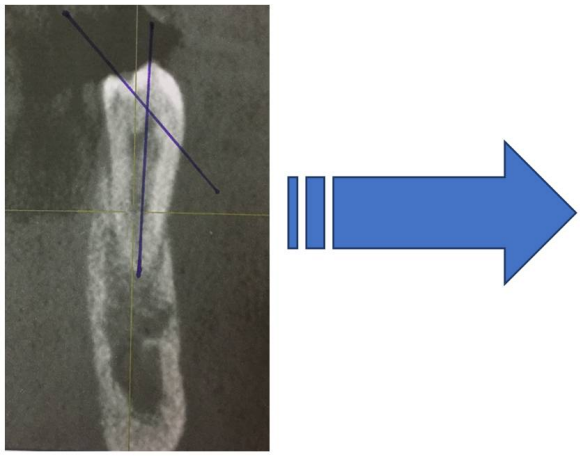

Figure 1

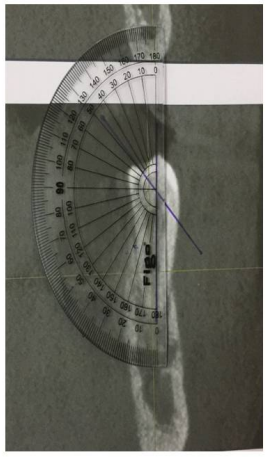

Figure 2

DISCUSSION

The CEJ is the most consistent, repeatable landmark for locating the position of the pulp chamber. This is known as the "law of CEJ". Law of centrality-the floor of the pulp chamber is always located in the center of the tooth at the level of the CEJ. These laws can be used as a guide for beginning the access. However, this law is consistently true only at the cemento-enamel junction and unrelated to the occlusal anatomy [9]. It is a proven fact that the pulp chamber is always in the centre at the level of the CEJ, the initial penetrating bur should be directed towards the centre of the CEJ. The operator can use the CEJ as a circular target regardless of how non anatomic the clinical crown or restoration may be[10]. Even if the crown sits at an obtuse angle to the root, the CEJ can still be a reliable landmark for locating the pulp chamber [11]. The visualisation of the pulp chamber's outline can be determined by another law- "the law of concentricity". According to this law, the walls of the pulp chamber are concentric to the external outline of the tooth at the cemento-enamel junction level. [12] This law will help in extending the access properly. Imaging serves all the stages of endodontics - the preoperative stage, intraoperative stage, and the post operative stage. [13] The mostimportant advantage of CBCT in endodontics is that it demonstrates anatomic features in 3D that intraoral, panoramic, and cephalometric images cannot. CBCT units reconstruct the projection data to provide interrelational images in three orthogonal planes (axial, sagittal, and coronal). In addition because reconstruction of CBCT data is performed natively using a personal computer, data can be reoriented in their true spatial relationships [14]. From the result (refertable 1), the mean angle of the mandibular first premolarswas found to be 46.80 in male and 57.30 in females. The mean angle of madibular second premolar was 53.45 in male and 57.75 in females. The angle was more in mandibular second premolars than in mandibular first premolars. The angle of the first premolars were more in female (57.30) than in male (46.80). The angle of mandibular second premolar was more in female (57.75) than in male (53.45).

CONCLUSION

The purpose of this study is to develop a methodology to measure the crown root angulation of mandibular premolars by using 3-dimensional volumetric images generated from cone-beam computed tomography scans.

CBCT aids in establishing proper root position which is a valuable screening in diagnosis and planning root canal treatment. By determining the crown root angulation of mandibular premolars, the burs can be oriented in a correct direction which will help in easy access opening. It is important to know the crown root angulation to prevent deviated access opening and perforation of the canal. It also help in reducing the fatigue of the instruments during cleaning and shaping of the root canals.

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