

Evaluation of Furcal Dentin Thickness in Primary Molars by Cone-beam Computed Tomography

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ABSTRACT : Introduction: The furcation area of deciduous molars is of special advantage because of its close anatomical relationship with the follicle of the permanent successors with varying degree of dentin thickness. So, the present In-Vitro study was carried out using Cone-beam Computed Tomography (CBCT) images to evaluate the Furcal Dentin Thickness in primary molars. **Material and Methods:** Cross- Sectional study is done with CBCT images. Furcal Dentin thickness of each right primary first and second molars were measured linearly in CBCT cross sections. Data were descriptively analyzed. **Results:** Total of 94 teeth with 46 right maxillary primary first molars and 48 right maxillary primary second molars of children age group 4-10 years were analyzed. The majority of them showed greater furcal dentin thickness were males than females. In primary maxillary right first molars the mean furcal dentin thickness was 1.73mm (p=0.115) and in primary maxillary right second molars the mean furcal dentin thickness was 1.75mm (p=0.220). Children showed less furcal dentin thickness in primary maxillary right first molars with (p=0.937). **Conclusion:** The mean furcal dentin thickness of primary molars was 1.65mm. Less furcal dentin thickness was associated with primary maxillary right first molars.

KEYWORDS: Furcal Dentin; Cone-Beam Computed Tomography; Molar

INTRODUCTION

The morphology of primary molars is complex [1,2], and these teeth have heavy pulp chambers [3,4] with auxiliary canals inside the floor and thinner dentin, characteristics that make this space permeable [3,5] and facilitate communication between the coronal pulp and the periodontal regions [6,7]. Additionally, pulp breakdown products and/or medications employed in pulp therapies may spill over into the region where the successor teeth are growing at the furcation [8-10]. Interproximal radiography [11], stereoscopic light microscopy [12], and computed tomography (CT) [13, 14] have all been used to measure the thickness of dentin within the pulp chamber floor of primary molars. However, those strategies have limitations. In light microscope techniques, stereoscopic and interproximal

radiographs reproduce two-dimensional photographs and single-plane visualization^[12-15] Furthermore, CT is an examination that emits excessive doses of radiation that constitute an extra biological risk to patients [16]. Cone beam computed tomography (CBCT) allows the capture of images capable of accurately determining dentin thickness on the floor of pulp chambers in primary molars^[15-16]. CBCT is a 3D imaging approach that helps in visualization of difficult tissues in the axial, sagittal and coronal planes [17-18]. So, the aim of this study is to use of Cone-beam Computed Tomography (CBCT) images to evaluate the Furcal Dentin Thickness in primary molars.

MATERIAL AND METHODS

Ethical Clearance

This study was approved by the Research Ethical Committee of KD Dental College and Hospital.

Study Design

This was a cross-sectional study conducted with data collected from the files of patients from the department of pedodontics and preventive dentistry, KD Dental College and Hospital. CBCT images of teeth of children from both sexes age group (4-10 yrs.), who had at least two primary molars with adequate dentin thickness from pulpal floor to the furcation area were included. Tomographic examinations that had artifacts that averted the assessment and confirmed primary molars positioned close to bone lesions had been excluded.

Calibration and Compliance

The calibration exercise was carried out by oral and maxillofacial radiologist. This study was conducted with the help of a pediatric dentist and the calibration was done by a radiologist. Before the study began, the program was consisted of theoretical knowledge and discussions about CBCT image evaluation, followed by practical sessions.

Furcal Dentin Thickness Measurements

The CBCT images were taken using the CS 8100 3D device with a 0.15 mm voxel size, 84kV, 4mA and 15s exposure and analyzed using CS 3D Imaging software. From an axial section with a thickness of 0.15 mm (Figure 1), a panoramic reconstruction with a thickness of 10 mm was obtained (Figure 2). The cursor was placed withinside the interradicular region of the primary molar, following its degree of inclination (long axis of the tooth), hence forming a cross section-shaped image. Using the software

linear measurement tool, the dentin thickness (in millimeters) was measured from the pulp chamber floor to the point closest to the furcation (Figure 3).

STATISTICAL ANALYSIS

The data are tabulated in Microsoft excel and analyzed with SPSS V.24 software. Thus, to analyze the difference in dentin thickness of primary molars in relation to sex, age (4 to 10 years), type of tooth (first or second molar), the continuous variables were presented with mean and standard deviation. The categorical variables were presented with frequency and percentage. Independent t test was used for the statistical analysis. The p value <0.05 is considered statistically significant.

RESULTS

A total of 94 teeth were included in the study. They were divided into 46 and 48 teeth in both of the groups respectively. Furcal dentin of all teeth was analyzed from both of the genders by independent 't' test with in age group (4-10 years). So, most of the dentin thickness of pulp chamber to the point near the furcation area in primary first and second molar was found in males with mean value of 1.73 (P value 0.115) and 1.75 (P value 0.220) respectively (Table 1 & 2). Second maxillary right primary molars showed higher mean value of 1.66 (P value 0.937) (Table 3).

*Independent t test was done.

TABLES

Table 1. Dentin thickness of pulp chamber floor to the point near the furcation area in primary first molar according to sex.

Variables	N%	Total Furcal Dentin Thickness (all teeth)	Mean (SD)	P Value
Males	25(56.5%)	45	1.73	0.115*
Females	20(43.5%)	31	1.55	

Table 2. Dentin thickness of pulp chamber floor to the point near the furcation area in primary second molar according to sex.

Variables	N%	Total Furcal Dentin Thickness (all teeth)	Mean (SD)	P Value
Males	26(54.2%)	45.5	1.75	0.220*
Females	22(45.8%)	34.1	1.55	

Table 3. Dentin thickness of pulp chamber floor to the point near the furcation area in primary right 1st molar and 2nd molar.

Variables	N%	Total Furcal Dentin Thickness (all teeth)	Mean (SD)	P Value
1 st Molar	46	76	1.65	0.937
2 nd Molar	48	79.6	1.66	

*Independent t test

FIGURES

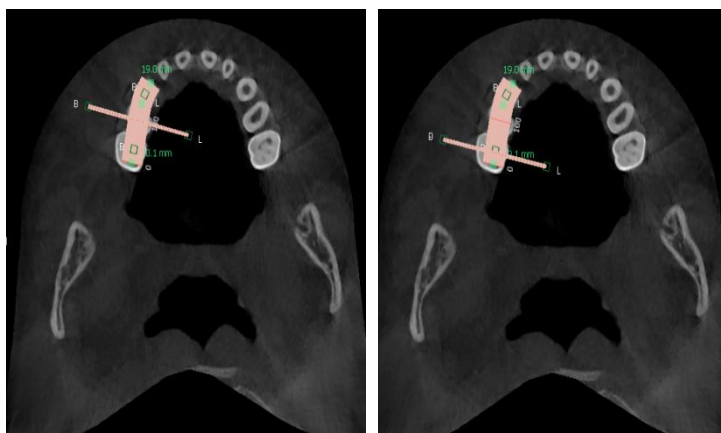


Figure 1. Axial CBCT section of maxillary right 1st primary molar (A) and right 2nd primary molar (B)

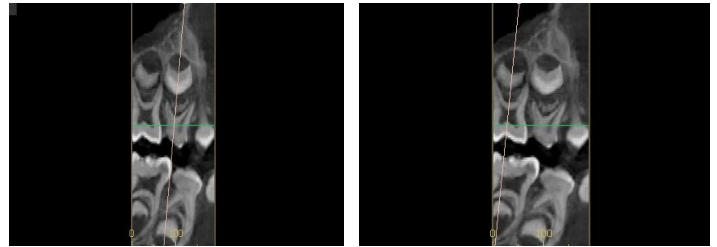


Figure 2. Panoramic reconstruction of maxillary right 1st primary molar (A) and right 2nd primary molar (B) arc CBCT. Cursor following long axis of the tooth (pink line).

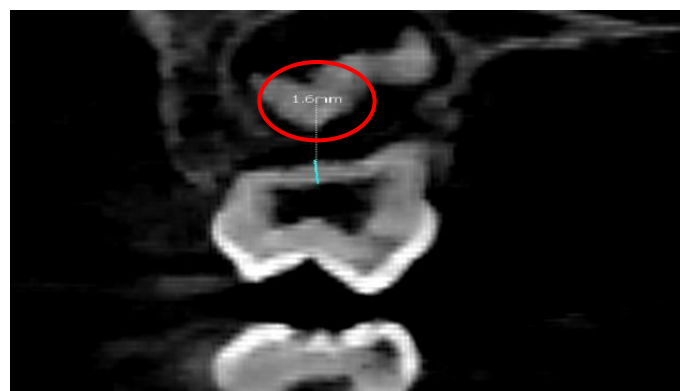


Figure 3. Transverse sections of maxillary right 1st primary molar (A) and right 2nd primary molar (B). Both molar regions showing the location of linear measurement of dentin thickness from pulp chamber floor to furcation region.

DISCUSSION

Due to its tight physical link with the follicle of the permanent replacement, the furcation area of deciduous molars is of exceptional relevance. Furthermore, pathological bone alterations caused by pulpal necrosis in primary molars are more likely to be identified in the interradicular area than at the apices [6]. So, the aim of this study was to use of Cone-beam Computed Tomography (CBCT) images to evaluate the Furcal Dentin Thickness in primary molars. As an emerging technology, CBCT has a lower radiation dose and a higher resolution than traditional computed tomography scans.

In present study, furcal dentin thickness of the pulp chamber floor to the nearest area of furcation in primary molars showed higher values in males in comparison to females. Study done by Tsatsoulis IN et al. compared furcal dentin thickness in different age group in children and they have concluded that variation of furcal dentin thickness in different age group due to the non-stop formation of dentin in the course of life children [19]. Hence, knowledge of the dentin thickness on the pulp chamber floor to the nearest area of furcation point represents a guiding factor in clinical practice, primarily during the coronal opening for endodontic interventions in young children [20,21]. When compared to the second molars in the current investigation, the primary first molars displayed less dentin thickness on the pulp chamber floor until the point near the area of the furcation. This thinner layer was anticipated given that these teeth are smaller than second molars. Some studies on thickness of pulp chamber done by Dabawala S et al., Gentner MR et al. resulted that no

consensus turned into located within the literature regarding their data [11-14]. CBCT images make it possible to accurately assess the dentin thickness of the pulp chamber floor to the point near the furcation area in primary molars [22-24]. The method, characterized as being non-invasive, affords smooth clinical application in addition, this study presents the differential of standardizing the reference points for the dimension of dentin thickness. This standardization will allow different researchers to breed the technique used. A limitation of the present study arose due to the similarity of tomographic density among dentin and cementum because it was not possible to distinguish these two tissues from each other in the images of CBCT. Primary teeth's cementum thickness, however, is micrometric, therefore it no longer interfered with the millimetric measurement of dentin thickness. [25]. This study has added to the literature by finding the mean values of dentin thickness on the pulp chamber floor to the point near furcal area in primary molars. This record presents essential expertise within the pediatric dental clinic because the decreased dentin thickness associated with accessory channels makes the pulp chambers floor region permeable.

CONCLUSION

The mean dentin thickness of the pulp chamber floor to the point near the furcal area of primary molars was 1.65 mm, ranging from 0.3 to 2.3 mm. Less dentin thickness was associated with maxillary primary first molars as compared to maxillary second molar.

CONFLICT OF INTEREST

No.

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