



Tooth coronal index and pulp/tooth ratio in dental age estimation on digital panoramic radiographs—A comparative study



Supreet Jain^a, Ravleen Nagi^{a,*}, Minal Daga^b, Ashutosh Shandilya^b, Aastha Shukla^b, Abhinav Parakh^c, Afshan Laheji^d, Rahul Singh^e

^a Department of Oral Medicine and Radiology, New Horizon Dental College and Research Institute, Bilaspur, Chhattisgarh, India

^b Department of Conservative Dentistry and Endodontics, New Horizon Dental College and Research Institute, Bilaspur, Chhattisgarh, India

^c Department of Public Health Dentistry, Government Dental College, Raipur, Chhattisgarh, India

^d Department of Oral and Maxillofacial Pathology, Daswani Dental College, Kota, Rajasthan, India

^e Department of Orthodontics, New Horizon Dental College and Research Institute, Bilaspur, Chhattisgarh, India

ARTICLE INFO

Article history:

Received 1 October 2016

Received in revised form 31 March 2017

Accepted 4 May 2017

Available online 12 May 2017

Keywords:

Age estimation

Pulp cavity height

Panoramic radiograph

Pulp/Tooth ratio

Tooth coronal index

ABSTRACT

Background: Assessment of an age of an individual whether living or dead through teeth is one of the most reliable and simple method to calculate age than skeletal remains especially when they are in poor conditions.

Objectives: The study was carried out with aim of (i) to evaluate reliability of dental age assessment through two different methods for adults i.e. tooth coronal index and pulp/tooth ratio using digital panoramic radiographs and (ii) to compare these methods for their accuracy in age determination.

Materials and methods: The digital panoramic radiographs of 180 subjects of Chhattisgarh aged 15–70 years were selected for the study. The measurements were performed on the JPEG images of selected panoramic radiographs by using Adobe Acrobat 7.0 professional software. For tooth coronal index (TCI), height of the crown i.e. coronal height (CH) and the height of the coronal pulp cavity i.e. coronal pulp cavity height (CPCH) of mandibular second premolars and first molars was measured in millimeter (mm) and then TCI was calculated for each tooth and calculated age was compared with chronological age. For pulp/tooth ratio, the measurements of pulp chamber height (PCH) and crown root trunk height (CRTH) were performed on the mandibular first and second molar teeth, the pulp chamber crown root trunk height ratios (PCTHR) of selected tooth were calculated. The acquired data were subjected to Pearson correlation test, unpaired t test and Analysis of Variance (ANOVA) analysis.

Results: Results suggested that TCI (mandibular first molar $r = -0.178$), second premolar ($r = -0.187$) and PCTHR (mandibular first molar $r = -0.921$, second molar $r = -0.901$) correlated negatively with chronological age suggesting decrease in size of pulp cavity. Mandibular first molar was found to be most reliable tooth to estimate dental age.

Conclusion: The study showed that both PCTHR and TCI have negative association with chronological age. PCTHR showed slightly higher negative correlation and proved as a better tool for age estimation than TCI. Statistically significant differences were observed between chronological and calculated age by both methods thus emphasizing the need for future clinical trials.

© 2017 Elsevier B.V. All rights reserved.

1. Introduction

Assessment of age through teeth is an important aspect of a new emerging science forensic odontology. Accurate estimation of age

is required for pediatric issues, orthodontic treatments to legal matters [1]. Although skeletal methods could be used for age estimation, but variability of bone maturation is influenced by several environmental factors. Tooth development shows less variability than other developmental features and shows low variability in relation to chronological age [2]. Moreover, dental tissues are more resistant to thermal, chemical and mechanical stimuli and are less affected by endocrine diseases or nutritional variations than other tissues. Therefore, teeth forms a unique and suitable parameter for dental age estimation [3]. Now a days they

* Corresponding author.

E-mail addresses: drsjain1985@gmail.com (S. Jain), ravleennagi@yahoo.in (R. Nagi), drminal1402@gmail.com (M. Daga), shandilyaashutosh16@gmail.com (A. Shandilya), aasthashukla1990@gmail.com (A. Shukla), drabhinavphd@gmail.com (A. Parakh), drafshanlaheji@gmail.com (A. Laheji).

have become important tool for age estimation for both deceased and living person for medico-legal purposes [1,4].

In children age calculation from teeth is simple and accurate and is based mainly on stages of development and eruption of tooth. In adults various methods have been developed to calculate age from dental tissue and tooth morphology [5]. These methods are classified as: radiologic and morphologic methods. Morphologic methods are sub classified into clinical, histological and biochemical examination. Radiographic methods are simple, nondestructive, requires comparatively less duration of time and expertise than morphologic methods [3].

Several studies have used canine, first premolar and second premolar on intraoral periapical and panoramic radiograph to estimate dental age as these teeth have good delineation of pulp chamber [3,6–9]. Some studies used mandibular first molar to predict dental age [4,10,11] and literature also revealed that only few studies were performed on mandibular second molars to estimate dental age [4,12]. The present study was undertaken in the department of Oral Medicine and Radiology, New Horizon Dental College and Research Institute with an aim to evaluate reliability of dental age assessment through two different methods for adults i.e. tooth coronal index and pulp/tooth ratio using digital panoramic radiographs and also to compare the methods for their accuracy in age determination.

2. Materials and methods

2.1. Subjects and materials

A total of 180 digital panoramic radiographs, obtained using SIRONA ORTHOPHOS XG Panoramic Machine, were selected from the archives of the department based on the inclusion and exclusion criteria. The digital panoramic radiographs of 180 subjects of Chhattisgarh aged 15–70 years were analyzed for following criteria:

1. They should be have good contrast and should be free of distortion.
2. They should present good image and good morphology of selected tooth with complete root formation i.e. mandibular second premolar and mandibular first and second molar.

2.2. Exclusion criteria

Digital panoramic radiographs showing image distortion, showing mandibular lesions, carious second premolar, molars or periapical pathology, root stumps, prosthesis, restorations in relation to selected teeth, missing selected teeth, severely attrited or fractured second premolar and mandibular molars, rotated or malaligned selected teeth and teeth with any developmental anomalies were excluded from the study.

2.3. Radiographic measurements

All 180 panoramic radiographs were subjected to radiographic measurements. They were exported to JPEG image format by using trophy Digital Image and Communications in Medicine [DICOM] software. The measurements were performed on these JPEG images by using Adobe Acrobat 7.0 professional software. All the measurements were recorded in millimeters [mm].

2.3.1. Measurement of tooth coronal index (TCI)

In the present study, for selected teeth (mandibular second premolar and mandibular first molar), a straight line (cervical line) was traced from the cemento enamel junctions which is the

division between anatomical crown and root. Coronal height (CH) was measured vertically straight from the cervical line to the tip of the highest cusp according to Moss et al. [13]. Coronal pulp cavity height (CPCH) was measured vertically from the cervical line to the tip of the highest pulp horn according to Ikeda et al. [14]. The measurements provided the TCI of each tooth which was then calculated as follows [Figs. 1 and 2]:

$$TCI = CPCH \times 100/CH$$

The measurements were displayed in mm along with captured image for further identification and reference. Intra observer measurements of three variables (CH, CPCH, and TCI) were also done. In the present study mean estimated age by TCI index was correlated with the chronological age of the subject.

2.3.2. Age assessment by pulp/tooth ratio of mandibular first and second molars

The measurements were performed by method proposed by Mathew et al. for right mandibular first and second molar, crown root trunk height (CRTH) was calculated which is the distance between the central fossa and the highest point on root furcation. Pulp chamber height (PCH) was calculated which is the distance between the roof and floor of the pulp of the pulp chamber in the same axis [Figs. 3 and 4]. Resultant pulp chamber crown root trunk height ratio (PCTHR) was calculated as:

$$PCTHR = PCH/CRTH$$

All the three readings were subjected to intraobserver variability and there was no statistically significant difference found and mean estimated age by PCTHR was correlated with chronological age of the individual.

2.4. Statistical analysis

Data was entered in a Microsoft EXCEL spreadsheet. Statistical analysis was done using the SPSS (Software Package for Social Sciences) Version 20.0 statistical analysis software. Pearson correlation coefficient was done between the chronologic age and TCI of second premolar and first molar. It was also used to find correlation between chronologic age and PCTHR of first and second molar and between PCTHR and TCI. Unpaired t-test was used to compare between chronologic age and mean estimated age determined by TCI and to compare between mean estimated age by first molar and second premolar using TCI. It was also used to compare between chronological age and mean estimated age by first and second molar and comparison between mean estimated age by first and second molar was also done by unpaired t test. One way Analysis of Variance (ANOVA) was applied to compare between mean chronologic age and estimated age by PCTHR and TCI. p value <0.05 was considered statistically significant.

3. Results

Digital panoramic radiographs of 180 subjects were analyzed of which 82 were males and 98 were females [Table 1]. By using TCI, there was statistically significant negative correlation between chronological age and TCI of mandibular first molar ($r = -0.178$) and second premolar ($r = -0.187$) and correlation coefficient (R^2) values for mandibular first molar and second premolar were 0.826 and 0.028, respectively [Table 2]. Thus, correlation of TCI with age was found to be higher for mandibular first molar. By using unpaired t test, there was statistically significant difference observed between the mean chronological age (37.87 ± 11.21) and mean calculated age (39.21 ± 6.78) for mandibular first molar with a p value <0.001, statistical significant difference was also observed between the

Download English Version:

<https://daneshyari.com/en/article/4760256>

Download Persian Version:

<https://daneshyari.com/article/4760256>

[Daneshyari.com](https://daneshyari.com)