AGE ESTIMATION BY PULP/TOOTH RATIO USING DIGITAL ORTHOPANTOMOGRAMS – A PRELIMINARY RETROSPECTIVE STUDY

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Highlights of the study

- *Radiographic assessment of age using orthopantomograms is reliable, non-destructive and non-invasive.*
- *The study used radiographic measurements of mandibular first and second molar teeth of both sides to derive a population-specific age estimation formula.*

Introduction

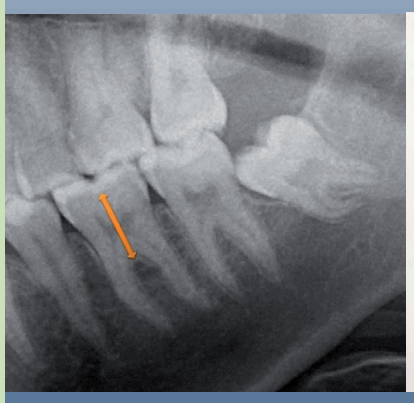
- Age estimation of both the living and the dead is one of the most important sub disciplines of forensic sciences and is of significance in medicolegal issues.
- Teeth can also be used to determine the age of a living individual in association with crimes and other purposes.[1]
- Radiographic assessment of age is a simple, noninvasive and reproducible method that can be employed on the living and unknown dead.
- After root completion, secondary dentine is deposited throughout one's life, reducing the pulp chamber. It is known that the size of the pulp chamber reduces as the chronological age advances and is least influenced by other environmental factors.[2]

Aim

- To evaluate the reliability of dental radiographic age assessment for adults using pulp /tooth ratio in digital panoramic radiographs.

Materials and Methods

- Sample: Digital orthopantomograms (OPG) of 20 individuals (10 males and 10 females) were taken from the digital archives (October 2019) of the Department of Oral Medicine and Radiology of our college.
- The measurements were performed on the JPEG images of selected digital OPGs.
- Inclusion criteria: Good quality radiographs of patients above 18 years of age
- Exclusion criteria: Distorted radiographs, root-canal-treated teeth, teeth with visible periapical pathologies, caries, attrition, radio-opaque fillings and crowns.
- Reference teeth : 36, 37, 46 and 47.
- Software used: GNU Image Manipulation Program (GIMP) [2.10.22]
- All measurements were recorded by a single observer.
- Chronological age of the subject was recorded based on his/ her date of birth.
- All data were entered and analysed using SPSS (Statistical package for social science) v11.5TM.
- Age estimation formula was derived by simple linear regression analysis.



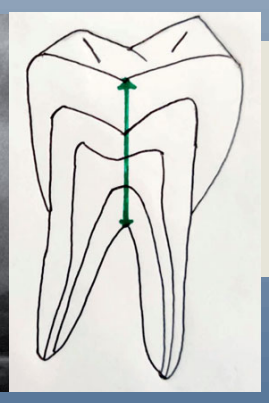


Fig 1:Crown Root Trunk Height (CRTH) was calculated by measurement of distance between the central fossa and the highest point on root furcation [represented by arrow].

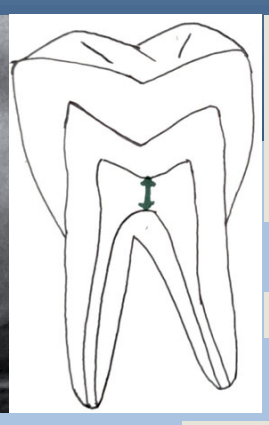


Fig 2: Pulp chamber Height (PCH) was calculated, which is the distance between the roof and floor of the pulp of the pulp chamber .

PCTHR= PCH/CRTH

PCTHR: Pulp Chamber Crown Root Trunk Height Ratio

Results

- The Pearson's correlation coefficient test shows that the PCTHR value of all the teeth except 36 are significantly correlated with age of the study population. (As age increases, there is a significant reduction in PCTHR of teeth 37, 46, and 47 in the study). [Table 1]
- R^2 value denotes the variance in the age as explained by the PCTHR value of tooth 47 in the study. It means that 66.2% of the change in age is explained by the change in the PCTHR value of tooth 47 in the study. [Table 2]
- The Pearson's correlation coefficient test shows that the predicted age and actual age are strongly correlated with each other (r=0.813).

Table 1 : Pearson's correlation coefficient test

Variables compared vs Age	Pearson's correlation coefficient (r)	Strength of correlation	Significance (P value)
PCTHR Tooth 36	-0.183	*	Non-significant (0.44)
PCTHR Tooth 37	-0.673	Moderate negative	Highly Significant (<0.001)
PCTHR Tooth 46	-0.607	Moderate negative	Significant (0.005)
PCTHR Tooth 47	-0.813	Strong negative	Highly Significant (<0.001)

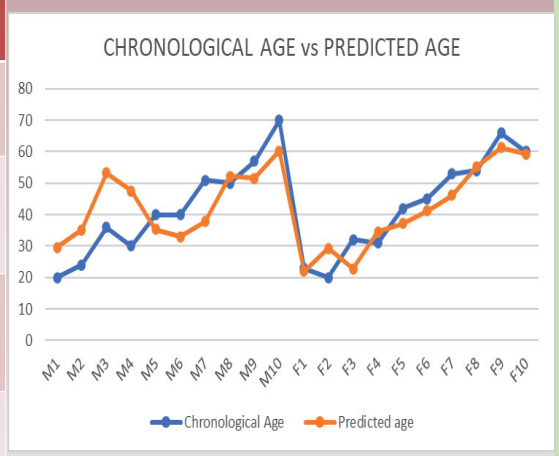


Table 2 : Estimation of actual age by PCTHR values of tooth 47 by simple linear regression analysis

Predictor	R	R Square	Adjusted R Square	Std. Error of the Estimate	Equation
47	.813	.662	.643	9.08353	Age = 79.061 – (161.21× PCTHR value of Tooth 47)

Discussion

- Various accurate age estimation equations have been derived for western populations which when applied to Indian samples produced unacceptable errors in forensic age estimation. In order to avoid this, it is advocated to derive age estimating formulas specific to the Indian population.[3]
- Mathew et al in his study for estimating age using first molar measurements in South Indian individuals found that there was a strong negative correlation between PCTHR and chronological age (r= -0.56, p=0.000).[4] The results of the present study were consistent with the study by Mathew et al.
- In the present study, we have used mandibular first and second molars on both sides, whereas most studies have used molars of a single quadrant. Individually, the PCTHR of tooth 37, 46 and 47 showed a statistically significant negative correlation with age. Strong negative correlation was seen with tooth 47 (p <0.001, r=-0.813).
- In molars, as the age advances, secondary dentine deposition happens preferentially on the roof and floor of the pulp chamber, reducing the height rather than width of the pulp chamber; therefore, the measurement of pulpal height is important.[5]
- The limitations of the study include (i) a small sample size and (ii) a single observer recording the measurements.

Conclusions And Future Scope

- This study showed that PCTHR has a negative correlation with chronological age.
- There was a statistically significant correlation observed between chronological and calculated age by this method .
- Validation with a larger population of wider geographic and ethnic diversity is recommended to generalise the results of this study.

References

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