Ann. For. Res. 65(1): 3473-3478, 2022
ISSN: 18448135, 20652445

ANNALS OF FOREST RESEARCH
https://www.e-afr.org/

PREDICTION OF AGE USING CEMENTUM IN SOUTH INDIAN POPULATION – AN OBSERVATIONAL STUDY

Running Title: AGE ESTIMATION USING CEMENTUM ANALYSIS.

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ABSTRACT

INTRODUCTION:

Age estimation plays a major role in evidence based dental identification, though the Forensic importance of age estimation criteria's includes certain parameters in tooth. The analysis of ground sectioned tooth in victim identification plays an important factor in prediction of age and sex of the particular person. Even with a single tooth, DNA analysis, Morphological analysis, Histopathological Analysis, Metric and Nonmetric analysis using radiographs can be done for the purpose identification.

AIMS:

The aim of the present study is to estimate the age of an individual by using width of the cementum with the help of a binocular light microscope.

MATERIALS AND METHODS:

The study sample consisted of 50 freshly extracted tooth was collected from random individuals between the age group of 20 to 70 years. Longitudinal ground sections of each tooth were prepared by using electrical lathe machine and finishing was done using arkansas stone. The ground sectioned tooth were examined under the binocular microscope in different magnifications (10x , 40x and 100 x). The results were calculated for further statistical analysis using SPSS software version 22.0.The results obtained were subjected to further Statistical Analysis.

RESULTS:

The results shows that, Since p values obtained were greater than 0.05 in both the cases, shows that there is no significant difference between ages as well as width of the cementum. The age shows minimum standard error of 2.2 for male, 2.6 for female and width of the cementum the standard error was 0.22 for male and 0.24 for females. The Regression analysis also was done to estimate age between both individual.

CONCLUSION :

Cementum is one of the major area to calculate age especially older individuals and it has evidenced a good results in many other studies. The present study conclude that the entire results shows that width of the cementum shows the very accurate results for age estimation .

KEY WORDS : Forensic Analysis, Personal Identification, Age Estimation, Cementum Line width .

INTRODUCTION :-

In this current era, civil and criminal cases are more and it takes places in personal identification too. For this purpose any civil and criminal cases age estimation is one of the major factor where the cases are lying between in “Court of Law”. Forensic odontology is a branch of forensic medicine and the interests of justice, deals with the proper examination, handling, and presentation of dental evidence in a court of law[1]. Age estimation is essential for identifying unidentified bodies or skeletal remains from accidents, crimes, and disaster victims.Dental age estimation is a very important aspect in forensic investigations[2]. The human dentition is naturally preserved for many years, though all body tissues, even bone gets disintegrated. Hard tissues like enamel, dentin and cementum are used to estimate the chronological age of unidentified individuals[3]. Gradual structural changes will occur in teeth throughout life that serves as the basics for age estimation. Many methods are currently in practice with various accuracy, prediction and reliability for age estimation[4].

Cementum is the calcified, avascular mesenchymal tissue that forms the outer covering of the anatomic root. It begins at the cervical portion of the tooth at the cementoenamel junction and continues till the apex[5]. It is deposited around the dentin, in layers throughout life, thereby increasing in thickness with age. Deposition is most rapid in apical areas, where it compensates for tooth eruption, as well as attrition. It varies from 16-60 micrometre on the coronal half to 150-200 micrometre in the apical third and furcation, and thicker on distal surfaces than on mesial surfaces. Between 11 to 70 years of age thickness of cementum increases around 3 folds[6]. Cementum formation continues throughout life and is deposited at a linear rate. More

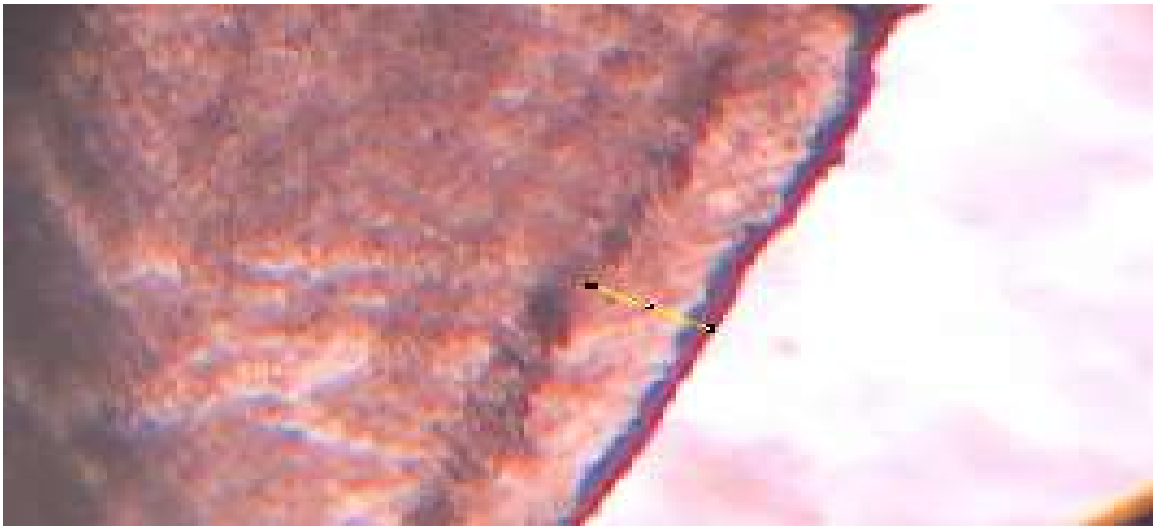
cementum is deposited apically than cervically. Cementum has a tendency to reduce root surface concavities; hence, thicker layers may form in root surface grooves and in furcation areas.Tooth cementurn annulation (TCA) method is the technique of choice for accurate age estimation in adults[7] .

Numerous studies have been carried out using tooth cemental annulations as criteria for age estimation, whereas only a few studies are reported on age estimation using only thickness of cementum. The aim of the present study is to estimate the age of an individual by using width of the cementum with the help of a binocular light microscope

MATERIALS AND METHODS :

The study samples consisted of 50 freshly extracted tooth collected from the Depatment of Oral Maxillofacial surgery, Adhiparasakthi Dental college and Hospital, Melmaruvathur. The age group were randomly distributed between 20 to 70 years of both sexes. Inclusion criteria was extracted for periodontal, orthodontic and esthetic purpose. Teeth which are excluded from this study are the attrition, hypercementosis, root caries, grossly decayed tooth and root stumps. After extraction, the extracted tooth were cleaned under running tap water and kept in 10% neutral buffered formalin for 24 to 48 hours. The sample bottles were labelled with actual age and the gender of the specimen. Longitudinal ground sections were prepared by using an electrical lathe machine and carborundum disc. Finishing was done using Arkansas stone and pumice powder until a thickness of 80µm was obtained. The mounted section of each tooth was viewed by using a Binocular Light Microscope examined under different magnifications (10x , 40x and 100x). The width of cementum was measured from the cementodentinal juction to the outer border of the root with the help of image analysis software.(IMAGE 1)

Image 1 shows width of the cementum



RESULTS :

The width of the cementum was measured and the data was recorded , tabulated and statistically analysed using Statistical Software Package for Social Sciences (SPSS) version 22.0 .

TABLE 1 shows Group Statistics for Age

GENDER	TOTAL	MEAN	STANDARD DEVIATION	STANDARD DEVIATION ERROR	p value
Male	27	42.3333	11.54590	2.22201	0.297
Female	23	38.5652	12.52570	2.61179	

Since The p value is 0.29 for the age group, Since (P = 0.05) there is no significant between the both sexes and the age groups.

TABLE 2 shows the group statistics for width of the cementum

GENDER	TOTAL	MEAN	STANDARD DEVIATION	STANDARD DEVIATION ERROR	p value
Male	27	0.3681	0.22009	0.4236	0. 492
Female	23	0.4143	0.25217	0.5258	

The P value is 0.49 for the width of the cemetum group, Since (P = 0.05) there is no significant between the both sexes and the age groups.

The regression formula given below

Male : Width of the cementum = 3.485 + 1.214 x Age

Female : Width of the cementum = 3.152 + 1.248 x Age

Constant value / Intercept value for male 3.485 and Regression coefficient of Intercept is 1.214.

Constant value / intercept value for female 3.152 and Regression coefficient of Intercept 1.248.

DISCUSSION :

The present study in male age group of standard deviation is 11.54 and for female age group of standard deviation is 11.52 was not significant. The maximum standard deviation for width of the cementum in male age group is 0.22 and for female age group 0.55. The width of the cementum also shows non significant . Statistical analysis by regression formula were performed mean value ± Standard deviation shows significant to estimate the age of the individual.

Similar study performed that Kwaal and Solheim et al described the extracted teeth in individual age group shows weeker correlation. But they have proved with regression analysis using TCA by fluroscent microscope.[8]Kasetty et al concluded TCA was not significant but proven by regression equation for age estimation using TCA by polarised microscope. [9]Zander and Hurzler stated in 1958 observed that straight line relationship between actual age with incremental lines of cementum and also said that when the dental age increases the number of incremental lines also increases**.** [10] Selukar *et al*. in 2002 done a study on cemental apposition with dental age. He concluded that the age advances the cemental apposition and number of incremental lines are increased and gives positive correlation between the age of the individual and cemental apposition**.** [11] Alghonamy et al proven that age estimation of human teeth shows accurate in phase contrast microscope compared to light and polarising microscope. [12] Kaur et al showed that Cementum annulations is clearly visible under contrast microscope > polarised

microscope > light microscope. [13]Godishala swamy et al showed significant in measuring the overlap or coronal migration of the cementum at the cementoenamel junction (CEJ) and the thickness of the cementum at the apical third of the root. [14]

CONCLUSION :-

Age estimation is an important identification for the forensic medicine.For the majority unidentified cases age estimation is the main and must criteria to evaluate and identify an person. Among the hard tissue, Cementum plays a major role for the anchorage of the tooth. The present study is reliable and conclude that the entire results shows that width of the cementum shows the very accurate results for age estimation.

ACKNOWLEGEMENT :-

I express my sincere gratitude to Dr. Abirami for her valuable guidance for the study.

FINANCIAL SUPPORT AND SPONSORSHIP :

Nil

CONFLICTS OF INTEREST :

There is no conflicts of interest

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