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Age estimation from Coronal displacement of cementum in impacted teeth: A Napalase Formula

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ABSTRACT

Rai B reported that positive correlation between coronal displacement of cementum in impacted teeth and age and proposed BR regression equation for Indian population .

Materials and methods -This study was conducted on 100 impacted mandibular third molars extracted from napalase healthy patients , aged between 18 and 22 years. The buccolingual ground sections were prepared and the distance between the edges of enamel and cementum were measured with micrometer attached to a light microscope.

Results and conclusion-The following regression equation was derived: *Age= (Cementum-enamel distance) +543/29.7*. A significant correlation (r = 0.89) between age and coronal displacement of cementum in impacted teeth was calculated and a regression equation was derived for age estimation.

Key words: Forensic science**;** Cementum; Enamel; Cemento–enamel junction; Fully impacted teeth; Mandibular third molar; Age estimation.

INTRODUCTION

Cementum is the calcified tissue that surrounds the dentine and forms the attachment site for the periodontal fibers that link the tooth to alveolar bone. In cementum formation, hypermineralized layer of extracellular matrix alternate with less mineralized layers. The first layer of acellular cementum is produced before the tooth erupts and further layers are added during and after eruption. Cementum layer consist primarily of uncalcified dense bundles of collagen fibrils. These bundles later become mineralized by hydroxyapatite crystals, the changing orientations of which may be responsible for the optical effect of alternating dark and translucent layers. The first use of cementum in human age estimation began with measurements of width of the total cementum layer rather than with counts of incremental lines.[1] Many questions remain unanswered regarding the mechanisms of tooth cementum annulations and its influencing factors, particularly concerning the interpretation of seasonal increments.2 G.G. Stott, R.F. Sis and B.M. Levy, Cemental annulations as an age criterion in forensic dentistry, *J Dent Res* **61** (1982), pp. 814–817. View Record in Scopus | Cited By in Scopus (19) [2-3] Two major factors are found to be responsible for these changes, which are environmental effects and aging.[4] Previous studies have reported significant positive correlation between age and coronal displacement of cementum in impacted teeth.

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[5-9] Previously I proposed a BR regression equation for age estimation from impacted teeth for north Indian population. It has been reported that different genetic factor, environmental factors, nutritional factors and geographical factors effect the dental structures [9-12] .Hence , the present study was planned to made a new regression equation of age estimation from impacted teeth by coronal displacement of cementum in napalase population.

METHODS AND MATERIALS

Our sample consists of 100 freshly extracted fully impacted permanent teeth third mandibular molar (50M and 50 F, aged between 18 and 22) collected from Napal population (table 1) . In addition to the extraction date of the tooth and reason for extraction, the records contain the patient's date of birth and ethnicity. In all cases, tooth extractions were performed as part of essential dental care. Additional care was taken during the extraction procedure to minimize damage to teeth. Teeth which were broken during extraction were excluded from the study.

The teeth were rinsed in running water and were placed in formalin solution for 17 days. The buccolingual ground sections were prepared from each specimen. The distance between the enamel and cementum, or the amount of cementum overlapping the cervical region of the ground sections of teeth, were measured by means of a micrometer attached to a light microscope. The measurements were (x) when there was a distance between cementum and enamel, (y) was assigned when there was an edge to edge relationship and (z) in case of cementum overlap. The data were entered into a computer using FOXPRO software and a data file was generated as in our previous studies [6-9]. The data was then analyzed utilizing statistical package of social sciences (version 11.0). The one way analysis of variance and student t-test were used to test the difference between means.

RESULTS

The measurement distance (ìm) between the edges of enamel and cementum in the impacted teeth and the age of patients in years has been shown in table 2.

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A significant correlation between the age of the patient and cementum overlap ($p < 0.01$, $r = 0.89$) on impacted teeth were observed and following new regression equation has been proposed

Age= (Cementum-enamel distance) +543/29.7

No significant correlation between the sex of the patients and cementum overlap (table 2).

DISCUSSION AND CONCLUSION

The study has shown that there is a highly significant correlation between age and coronal displacement of cementum in impacted teeth as in previous study.[5-9] It has been observed that continuous displacement of cementum occurs with aging. The previous studies observed that there was no correlation between age and coronal displacement in cementum in erupted teeth because of direct contact with external environment.[5-9] There were significant difference between the previous BR regression equation and present regression equation [7].It may be due to different genetic factor, environmental factors, nutritional factors and geographical factors [9-12].Hence , the present study can be applied for age estimation in impacted teeth in napalase. Further study will be required to find out the accuracy of this regression in same population. However, as soon as possible, the regression model will be compared with data from Asian &European countries populations of Africa and America due to different factors.

CONFLICT OF INTEREST

None declared.

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Table 1. Age and sex distribution of studied individuals

Age	Females	Males	Total
18-19	14	14	28
19.1-20	12	12	24
20.1-21	8	8	16
21.1-22	16	16	32
Total	50	50	100

Table 2. The results of cementum enamel distance (ìm) measurements in impacted teeth in different age groups (years)

Age groups	Cementum and enamel distance (µm) (mean + SD)	Cementum and enamel distance (µm) (mean + SD)	Cementum and enamel distance (µm) (mean + SD)
	Impacted teeth	Impacted teeth of male	Impacted teeth of female
18–19	X 74.39 ± 0.56	X 73.34 ± 0.28b	X 75.30 ± 0.27a
19.1-20	Z129.98 ± 1.24	Z130.55 ± 1.39b	Z128.38 ± 1.19a
20.1-21	Z 157.34 ± 0.22	Z 158.29 ± 0.13b	Z 156.27 ± 0.26a
21.1-22	Z210.21 ± 0.27	Z211.21 ± 0.34b	Z208.24 ± 0.23a

$p < 0.01$.
a PNS as compared to b