TECHNICAL NOTE

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Accuracy of BR Regression Equation for Impacted Teeth in Age Estimation in Haryana Population of India

ABSTRACT: Dental cementum is a vital tissue that demonstrates continuous apposition throughout the life of a tooth. Positive correlation has been reported between the coronal displacement of cementum and age in impacted teeth and BR regression equation has been proposed. The present study is an attempt to calculate accuracy of BR regression equation in Haryana population of India. The study was conducted on 20 impacted mandibular third molars extracted from healthy patients, aged between 22 and 32 years. The bucco-lingual ground sections were prepared and the distance between the edges of enamel and cementum were measured with micrometer attached to a light microscope and BR regression equation was applied for age estimation. Although the estimated age with BR regression equation was less than chronological age it was not statistically significant. Hence, the BR regression equation can be used in medicolegal as well as in forensic odontology for age estimation.

KEYWORDS: forensic science, forensic odontology, age estimation, impacted teeth, mandibular third molar, BR regression equation.

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 layers 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 consists 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 (2,3). 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 (5–7). It has been proposed that BR regression equation can be used for age estimation from impacted teeth (7). Hence, the study was planned to determine the accuracy of BR regression in age estimation from impacted teeth in Haryana population of India.

Methods and Materials

The sample for this study consists of 20 freshly extracted fully impacted permanent third mandibular molars (from patients aged

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between 22 and 32 years) collected from Jain Dental Clinic, New Delhi, India. 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 bucco-lingual 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 measurement (x) was assigned 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 (Fig. 1). The following BR regression equation was applied on all the teeth (7).

$$Age = \frac{(\text{Cementum-enamel distance}) + 439}{22.4}$$

Results

The estimated age on applying the BR regression equation was observed to be 2–5 years less than chronological age (Table 1) but was not statistically significant.

Discussion and Conclusion

Previous studies have shown that there is a significant correlation between age and coronal displacement of cementum in impacted teeth (5,7). It has been concluded that continuous displacement of cementum occurs with aging. However, there was no correlation between age and coronal displacement in cementum in erupted
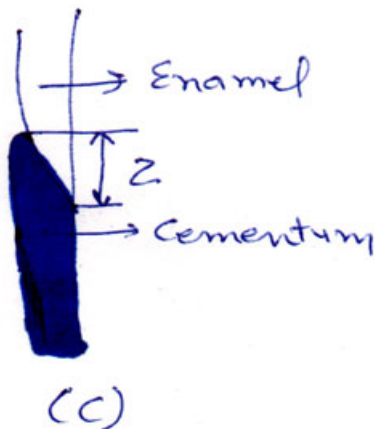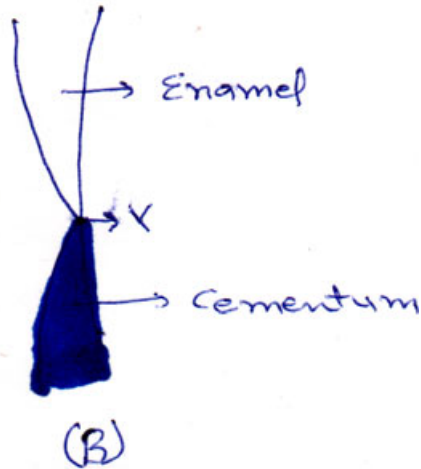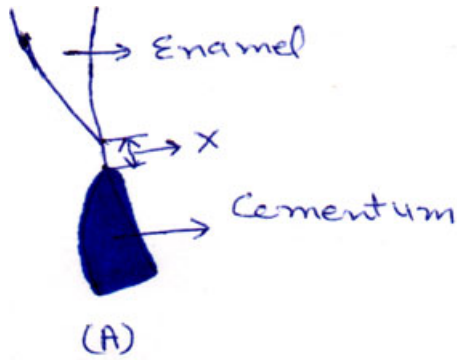
FIG. 1—(A) The measurement (X) was assigned when there was a distance between cementum and enamel. (B) The measurement (Y) was assigned when there was an edge to edge relationship cementum and enamel. (C) The measurement (Z) was assigned in cases of cementum overlapping the enamel.

teeth, maybe because of direct contact with the external environment (5,7). It has been further observed that the BR regression equation underestimates the age of the subjects.

TABLE 1—The estimated age and chronological age (year) in Haryana population.

S.no	Estimated age (in years)	Chronological age
1	28.2	27.6
2	29.4	32.5
3	26.4	32.6
4	22.7	30.4
5	20.2	24.3
6	21.3	23.6
7	24.7	28.6
8	26.5	29.5
9	28.4	31.4
10	26.3	30.4
11	25.5	31.4
12	23.1	24.2
13	22.6	24.7
14	23.4	26.8
15	24.7	28.4
16	23.7	25.8
17	24.7	27.4
18	21.6	24.7
19	24.7	27.7
20	22.2	25.4

These are the preliminary findings of our study. Due to small sample size and number of teeth in the present study, further studies on large sample and different population groups are recommended so that the reliability and accuracy of BR regression equation can be proved. We conclude that BR regression equation can be of significance in age estimation from impacted teeth from the medicolegal point of view.

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