

# Age estimation from coronal displacement of cementum in impacted teeth: a napalase formula

\*Balwant Rai, \*\*Jasdeep Kaur, \*\*\*Hamid Jafarzadeh, \*\*\*\*Rajnish K. Jain

\*MS (Forensic Odontology), PG (Medical RAdiology)

Crew-78, Health and Safety Officer, Mars Mission, NASA, USA,

\*\*MS (Std), School of Dentistry, Oral Pathology & Maxillofacial Surgery Katholieke Universiteit Leuven, Kapucijnenvoer 7, B-3000 Leuven, Belgium,\*\*\*DDS, MSc, Iran, \*\*\*\*MDS, Assoc. Prof.

Dept. Conservative Dentistry & Endodontics, Teerthanker Mahaveer Dental College & Research Centre, Moradabad

## Abstract

Backgrounds-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.

**Keywords:** 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.<sup>1</sup> Many questions remain unanswered regarding the mechanisms of tooth cementum annulations and its influencing factors,

particularly concerning the interpretation of seasonal increments.<sup>2</sup> 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)<sup>2,3</sup> Two major factors are found to be responsible for these changes, which are environmental effects and aging.<sup>4</sup> Previous studies have reported significant positive correlation between age and coronal displacement of cementum in impacted teeth.<sup>5-9</sup> 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<sup>9-12</sup>. 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)

**Reprints Requests:** Jasdeep Kaur, BDS, MS  
School of Dentistry, Oral Pathology & Maxillofacial Surgery, Katholieke Universiteit Leuven, Kapucijnenvoer 7, B-3000 Leuven, Belgium

collected from Nepal 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 <sup>6-9</sup>. 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 (im) between the edges of enamel and cementum in the impacted teeth and the age of patients in years has been shown in table 2.

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

$$\text{Age} = (\text{Cementum-enamel distance}) + 543/29.7$$

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.<sup>5-9</sup> 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.<sup>5-9</sup> There were significant difference between the previous BR regression equation and present regression equation <sup>7</sup>.It may be due to different genetic factor, environmental factors, nutritional factors and geographical factors <sup>9-12</sup>.Hence , the present study can be applied for age estimation in impacted teeth in nepalase. 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.

**Table 1. Age and sex distribution of studied individuals**

Sr.No.	Tooth	Regression formula	r <sup>2</sup>
1.	Maxillary central incisor	82.436 – 562.832 x1	0.912
2.	Maxillary lateral incisor	97.326 – 593.862 x2	0.832
3.	Maxillary canine	84.562 – 462.652 x3	0.923
4.	Maxillary first premolar	92.462 – 632.498 x4	0.896
5.	Maxillary second premolar	99.784 – 643.952 x5	0.736
6.	Maxillary First molar	102.432 – 832.121 x6	0.838
7.	Maxillary Second molar	104.563 – 432.836 x7	0.864
8.	Maxillary third molar	108.632 – 732.941 x8	0.532
9.	Mandibular Central incisor	84.536 – 893.452 y1	0.692
10.	Mandibular Lateral incisor	96.832 – 932.863 y2	0.789
11.	Mandibular canine	98.962 – 432.663 y3	0.863
12.	Mandibular first premolar	109.873 – 563.463 y4	0.797
13.	Mandibular second premolar	93.897 – 932.469 y5	0.786
14.	Mandibular first molar	106.967 – 847.652 y6	0.764
15.	Mandibular second molar	108.623 – 867.497 y7	0.787
16.	Mandibular third molar	95.632 – 992.432 y8	0.797

**Table 2. The results of cementum enamel distance (im) 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	Z 129.98 ± 1.24	Z 130.55 ± 1.39b	Z 128.38 ± 1.19b
20.1-21	Z 157.34 ± 0.22	Z 158.29 ± 0.13b	Z 156.27 ± 0.26a
21.1-22	Z 210.21 ± 0.27	Z 211.21 ± 0.34b	Z 208.24 ± 0.23a

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

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## How to publish your journal paper

The Catch 22 in research publishing is that few authors work effectively in the process until after they've published a few manuscripts. The good news is that experienced journal editors and authors are willing to pass on their secrets of success. Here is their best advice.

### Have a focus and a vision

Angela M. Neal-Barnett, PhD, of Kent State University and author of the forthcoming book, "Bad Nerves" (Simon & Schuster, 2003), as well as numerous papers in multiple journals believes that the key to successfully publishing an article is to "get a vision"--a reason and purpose for writing. That concept isn't always familiar to academicians who often write because they have to for tenure or promotion, she says. But, she advises, while "academic wisdom [says] 'publish or perish,' ancient wisdom says 'without vision, the people will perish.'"

Once you have a vision, says Neal-Barnett, write it down and keep it in constant view to remind you of your mission.

### Write clearly

"There is no substitute for a good idea, for excellent research or for good, clean, clear writing," says Nora S. Newcombe, PhD, of Temple University, former editor of APA's *Journal of Experimental Psychology: General*.

Newcombe endorses the advice of Cornell University's Daryl J. Bem, PhD, who in *Psychological Bulletin* (Vol. 118, No. 2) wrote that a review article should tell "a straightforward tale of a circumscribed question in want of an answer. It is not a novel with subplots and flashbacks, but a short story with a single, linear narrative line. Let this line stand out in bold relief."

Newcombe also admits that neatness counts. Though she tries not to get in a "bad mood" about grammar mistakes or gross violations of APA style, she says, such mistakes do

"give the impression that you're not so careful."

### Get a pre-review

Don't send the manuscript to an editor until you have it reviewed with a fresh eye, warns Newcombe. Recruit two objective colleagues: one who is familiar with the research area, another who knows little or nothing about it. The former can provide technical advice, while the latter can determine whether your ideas are being communicated clearly.

Many academic departments form reading groups to review each others' papers, says Elizabeth M. Altmaier, PhD, editor of *Clinician's Research Digest: Briefings in Behavioral Science*. "New faculty should and can form reading groups where they can exchange drafts and get feedback to each other," she says.

After you've gotten that fresh critique of your work, says Newcombe, listen to the pre-reviewer's advice. If the reviewer down the hall "didn't really understand page six and therefore got lost in page 13," she says, "don't just say they didn't read carefully--other people are going to make that same error."

For a final check, some editors suggest having the manuscript professionally copy-edited (see Further reading).

### Send your manuscript to the right journal

Many rejections are the result of manuscript-journal mismatch--a discrepancy between the submitted paper and the journal's scope or mission. Newcombe advises authors to consider the "theoretical bent" of the papers that regularly appear in the journal before they submit a paper to it.

A major faux pas is submitting your manuscript simply to get it reviewed, says Newcombe. She's heard authors say, "This is a small experiment that I know would never get published in that journal, but I would like to get some