

Coronal Displacement of Cementum in Impacted Teeth: Age Determination

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Abstract: Dental cementum is a vital tissue which demonstrates continuous apposition throughout the life of the tooth. This study was conducted on 101 impacted and 106 erupted mandibular third molar teeth extracted from healthy patients, aged 18-30 years. The buccolingual ground sections were prepared. The distance between the edges of enamel and cementum were measured with micrometer attached with light microscope. The study indicated that the cementum in impacted teeth displaced toward coronal during aging. This phenomenon could be used in forensic odontology in age estimation.

Key word: Cementum % enamel % cemento-enamel junction % impacted % mandibular third molars % age estimation

INTRODUCTION

Cementum is the calcified tissue that surrounds the dentine and forms the attachment site for the periodontal fibres 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, whose changing orientations 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 regarding the mechanisms of tooth cementum annulation and its influencing factors, particularly concerning the interpretation of seasonal increments [2-3]. Two major factors are found to be responsible for these changes environmental effects and aging [4].

Erupted teeth are directly affected by conditions such as mastication, tooth brushing, and by aging while impacted tooth remain intact and are only affected by aging cementum deposition on a healthy tooth continues throughout life and a relationship exists between age and cementum thickness [5]. In the present

study we focus on the coronal displacement of cementum with age in impacted teeth for age determination.

MATERIALS AND METHODS

Our sample consists of 207 freshly extracted permanent teeth third mandibular molar (101:106, impacted: erupted) collected from Government Dental College, Rohtak. 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 in the extraction procedure to minimize damage to teeth; teeth which were broken during extraction were excluded from the study. The teeth were obtained from healthy patients ranging in age between 18 to 30 years.

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 generated. The

Table 1: The results of cementum enamel distance (μm) measurements in impacted and erupted teeth in different age groups (years)

Age groups	Cementum and enamel distance (μm) (mean + SD)	
	Impacted teeth	Erupted teeth
18-20	5.92 ± 0.21	1573.2 ± 0.34
21-23	98.42 ± 0.34	156.21 ± 0.42
24-26	137.25 ± 0.23	156.24 ± 0.43
27-30	185.23 ± 0.24	156.27 ± 0.43

$p < 0.01$

data were then analyzed utilizing statistical package of social sciences. The one way analysis of variance and student t-test were used to test the difference between means.

RESULTS

In Table 1, the measurement distance (μm) between the edges of enamel and cementum in the impacted and erupted teeth and the age of patients in years.

Correlation was found between the age of the patient and cementum overlap ($p < 0.01$) on impacted teeth. However, no correlation was found in erupted teeth.

DISCUSSION AND CONCLUSION

The main criteria for forensic age determination in the relevant age group based on odontological examination are tooth eruption and tooth mineralisation, tooth developmental biological features. A pulpless tooth still presents vital cementum [6] and there is a straight line correlation between age and cementum thickness in impacted teeth [5]. Our study shows that there is a significant linear correlation between age and coronal displacement of cementum in impacted teeth.

There was no correlation between age and coronal displacement of cementum in erupted teeth because erupted teeth were found to be directly exposed to external environmental factors. This may be related to continually erupting forces which affect the impacted teeth and may be mechanism by which the teeth are protected at the cemento enamel junction.

This phenomenon could be used in forensic odontology in age determination. It is evident that the problem of age estimation from teeth is an active area of research that requires much research work.

REFERENCES

1. Gustafson, G., 1950. Age determination of teeth. *J. Am. Dent. Assoc.*, 41: 45-54.
2. Stott, G.G., R.F. Sis and B.M. Levy, 1982. Cemental annulation as an age criterion in forensic dentistry. *J. Dent. Res.*, 61: 814-817.
3. Lieberman, D.E., 1994. The biological basis for seasonal increments in dental cementum and their applications to archaeological research, 21: 525-539.
4. Nitzan, D.M., Michaelir and B. Azaz, 1986. The effect of aging on the tooth morphology. *Oral Surg. Oral Med. Oral Pathol.*, 61: 54-60.
5. Stein, T.J., J.F. Corcodan, A. Park and A. Arbor, 1990. Anatomy of the root apex and it is histologic changes with age. *Oral Surg. Oral Med. Oral Pathol.*, 69: 238-242.
6. Grossman, E.S. and J.A. Hargreaves, 1991. Variable cemento - enamel junction in one person. *J. Prosthet. Dent.*, 65: 93-97.