

Sexual Dimorphism: Dentin Formation And Odontoblast

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Citation

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Abstract

Objectives: To evaluate the dimorphism in odontoblast and dentin formation in gender.

Methods: We evaluated 159 (normal patients i.e. without any systemic disease) intraoral periapical radiographs of mandibular second molar (parallel i.e. long cone technique of radiograph); aged between 8 to 20 years. The images were grouped into three groups. Dentin height, enamel height, pulp height and crown width were measured. Measurements were made by two observers.

Results: Dentin height, pulp height and crown height were significantly larger in male as compared to females. When dentin height, enamel height and pulp height were calculated as ratio of crown width, only dentin height to crown width showed significant large differences in females as compared to males.

Conclusion: Several dimorphism exists in the odontoblast cell i.e. dimorphism in dentin thickness.

INTRODUCTION

Odontometry has been performed on various tooth groups with the objective of establishing measurements that can act as standards, and this may also facilitate certain procedures to the dental surgeon. The importance of odontometric studies of teeth in some orthodontic techniques is well known, such as, in 'dental prosthesis' for evaluating teeth support, and in endodontics for determining total tooth length.¹ The surface area of dentin is much larger at dentino-cemental junction, than it is on the pulp cavity side. In coronal dentin, the average diameter of tubules at dentino-enamel junction is 0.5 to 0.9 μm , but this increases to 2 to 3 μm at the pulp. After the primary dentin is formed, dentin deposition continues at a reduced rate even without obvious external stimulus, though the rate and amount of this physiologic secondary dentin varies considerably among different individuals. Secondary dentin forms on all internal aspects of the pulp cavity, but in the pulp chamber in multirrooted teeth it tends to be thicker on the roof and floor than on the side walls.² Sex differences have been reported in the volume of dentin pulp complex and enamel,^{3,4,5,6} and sex hormones appear to affect odontoblast function later in life. Estrogen receptor antigens have been identified in pre-dentinal odontoblastic layer and pulpal blood vessel of

extracted human wisdom teeth of the both sexes.⁶

This study determines that dimorphism in odontoblast activity occurs even before puberty, and is expressed as differences in dentin thickness. The study was carried out on the intraoral periapical radiographs of permanent mandibular second molars. In this tooth, the crown formation occurs around 7-8 years, and root formation is completed at 14-15 years of age.⁷ The sample was divided into three groups designated to provide information on primary dentin thickness, the combined thickness of primary and secondary dentin laid down, before puberty, and the amount of dentin laid down during adolescence.

MATERIALS AND METHODS

Intraoral periapical radiographs of mandibular second molars (parallel i.e. long cone technique) without restorations or fractures were taken from 83 males and 76 females (without any systemic disease), aged between 8 to 20 years, and were treated at Government Dental College, Pt. B.D. Sharma Postgraduate Institute of Medical Sciences, Rohtak (Haryana). Only radiographs with good superimposition of cusp tips and no overlapping of mesial and distal borders of adjacent teeth were taken. Enamel height, dentin height and pulp height were measured.

We performed all the measurements using a digital caliper on a light table. The measurements were expressed in mm, student's "t" test was used for the statistical analysis, with the results being expressed as mean value and standard deviation. Dentin thickness in the three groups, however, represented the total dentin formed under different conditions. In the first group, all dentin was present in primary dentin, since the roots were not yet fully formed. In the second group, there was presence of some secondary dentin, while in the third group, dentin thickness represented the total amount of dentin formed (primary as well as secondary).

RESULTS

Figure 1

Table 1: shows the mean values and standard deviation of Enamel height, dentin height, pulp height and crown width (in mm) for second mandibular molars in males and females

	8-9 years		9.1-13 years		13.1-20 years	
	Male	Female	Male	Female	Male	Female
Enamel height	1.92 ± 0.33**	1.83 ± 0.37**	1.90 ± 0.33**	1.76 ± 0.35**	1.86 ± 0.37**	1.75 ± 0.32**
Dentin height	3.33 ± 0.42**	3.32 ± 0.33**	3.62 ± 0.42**	3.42 ± 0.52*	4.13 ± 0.39**	4.02 ± 0.37**
Pulp height	2.15 ± 0.52*	2.17 ± 0.59*	2.02 ± 0.33**	2.01 ± 0.43**	1.83 ± 0.34**	1.82 ± 0.42**
Crown width	11.84 ± 0.32**	11.62 ± 0.43**	11.83 ± 0.47**	11.59 ± 0.57*	11.79 ± 0.42**	11.56 ± 0.36**

*p>0.01

**p>0.05

For the samples, dentin height, pulp height and crown height were significantly larger in males as compared to females. When dentin height (DH), enamel height (EH) and pulp height were calculated in respect to crown width (CW), only DH/CW showed significant large differences in females as compared to male and rapid formation of dentin with advancement in age in females. Pulp height is greater during 9 to 13 years of age but it is larger in males as compared to females. It also found that dentin formation after 9 years was increased in both the gender.

DISCUSSION

Dimorphism in the dentin pulp complex of the permanent mandibular second molar is often expressed relatively in thinner enamel as compared to crown size and faster

apposition of dentin. Philippas (1961)⁸ studies carried out on the teeth of individuals of unknown sex have shown that more dentin is deposited on the floor of the pulp chamber of multi rooted teeth than on the roof or walls. This was due to reduced growth potential of coronal odontoblast. Our study, proved that reduction in pulp chamber height in females is faster due to rapid formation of secondary dentin. It may be possible due to sex differences as well as secondary dentin formation i.e. dimorphism in odontoblast cell. This dimorphism may be related to different developmental pathway of coronal and radicular odontoblasts. Drusini et al. (1977)⁹, Solheim (1992)¹⁰. The results concluded that dimorphism exist in the odontoblast activity.

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