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DENTAL AGE ESTIMATION IN CHILDREN USING WILLEMS METHOD AND ITS CORRELATION WITH CHRONOLOGICAL AGE: A DIGITAL ORTHOPANTOMOGRAPHIC STUDY

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ABSTRACT

Aim and Objective: To assess the developmental stages of seven mandibular left teeth for estimation of dental age (DA)in children aged 8-16 years of south Kerala origin and to evaluate the possible correlation between DA and chronological age (CA) using Willems method.

Materials and methods: Digital OPGs of 60 subjects (30 males and 30 females) who fit the study criteria were obtained .Assessment of mandibular teeth (31-37) development was undertaken and DA was assessed using Willems method.

Results and Conclusion: There was significant correlation between DA and CA in both males (r=0.847) and females (r=0.801).The overall mean differences between DA and CA was 0.5 ± 1.2 with a gender variability as 0.330 ± 1.045 for males and 0.603 ± 1.417 for females.

KEYWORDS : dental age, chronological age, Willems method

Introduction

Determination of dental age (DA) is important in clinical dental practice and forensic odontology 1. In legal point of view; it becomes significant when there is a dispute regarding the chronological age (CA). It is applicable in situations regarding social benefits, employment and marriage.2 The chronological age can be assessed by correlating the physical, skeletal, and dental maturity of an individual. Several methods have been proposed for assessing dental development, which is generally referred to as dental age estimation techniques. These techniques are based on tooth mineralization and tooth eruption patterns. Eruption may be influenced significantly by various factors such as local infection, crowding, obstruction, and premature extraction or loss of the deciduous teeth or adjacent permanent teeth. This makes it impossible to use eruption alone for age estimation in most of the situations. Methods of DA estimation relying on the evaluation of the mineralization and growth stage of the teeth seem to be scarcely affected by local and systemic factors,3even though it exhibits population differences and show an ethnic variability.4

The most widely used method for DA estimation was proposed by Demirjian et al in1973 5. This method has been tested in various populations as an age estimation technique 6, 7. In 2001, Willems et al., 8 evaluated the accuracy of Demirjian method in Belgian Caucasian population and modified the scoring system when a significant overestimation was reported. This modification has been evaluated in various studies and has been reported to be more accurate 9, 10 compared with the original method. The aim of this study was to evaluate the applicability of Willems et al., method of DA estimation in children aged 8-16 years of South Kerala origin.

Materials and Methods

The study sample consisted of 60 randomly selected subjects (30 males and females) of age ranging from 8 to 16 years. The study was approved by the Ethical Clearance Committee of our institution and the study subjects were recruited from children reporting to the radiology clinic for taking digital radiographs for treatment purposes. They were screened to satisfy the inclusion criteria. Physically or mentally challenged children and subjects with serious medical illness, endocrine disturbances, and congenital developmental abnormalities were not included. Individuals with history of extraction of permanent teeth, trauma to the face, impacted or ankylosed teeth and cases of gross malocclusion were also excluded. Name, sex, and date of birth of each individual and date of radiography were recorded. All the radiographs were taken with PROMAX digital Planmeca Machine (Planmeca OY, Asentajankatu 6, FIN-00880 Helsinki, Finland).

Table 1: Distribution of entire sample according to age and sex

Age	Male		Female		Total	
	N	%	N	%	N	%
<10	8	26.7	3	10.0	11	18.3
10-13	16	53.3	18	60.0	34	56.7
>13	6	20.0	9	30.0	15	25.0
Total	30	100.0	30	100.0	60	100.0

Assessment of dental age using Willems method

CA of an individual was calculated by subtracting the birth date from the date on which the radiographs were exposed for that particular individual. To have an accurate analysis, the exact age of the individual including the months and completed days were taken and converted to decimal values. Digital panoramic radiographs (orthopantomograms [OPGs]) of all children were used to assess the status of maturation on the basis of calcification of the permanent teeth in mandibular left side, from central incisor to the second molar, using Demirjian et al., 8 method. To avoid observer bias, each digital OPG of an individual was coded with a numerical identity number (1-60) to ensure that the examiner was blind to sex, name and age of subjects. Tooth formation is divided in to 8 stages based on the development criteria. After noting all stages of teeth from 31-37, the developmental status of a particular tooth was calculated in years on the basis of tables given by Willems.8

Results

Comparison of the DA applying the Willems method, the CA and the correlation between DA and CA of both gender are presented in Table 2. The mean CA was 11.7± 2.2 and the estimated DA by Willems method was 11.2 ±1.8 with a mean difference of 0.5 ±1.2. For males, the mean CA was11.28 ±1.91 and the estimated DA by Willems method was 10.95 ±1.86 with a mean difference of 0.330 ±1.045. For females, the mean CA was12.07 ± 2.35 and the estimated DA by Willems method was 11.47 ±1.70 with a mean difference of 0.603 ± 1.417. Spearman rank correlation test showed a significant relation between DA and CA (r =0.830; p<0.001).There was a significant relation between DA and CA in both males (r = 0.847; p<0.001) and females (r = 0.801; p<0.001).Willems method (from the Belgian Caucasian population) underestimated the mean age of the study population by 0.5 years and it underestimated the mean age of males by 0.3 years and females by 0.6 years and independent t-test showed that these differences were statistically not significant (P > 0.05).

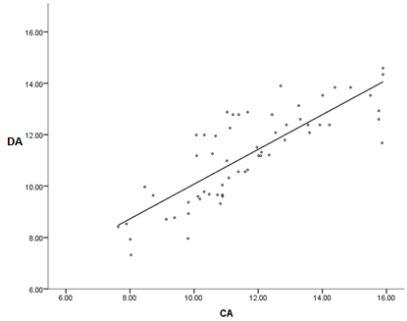

Table 2: Comparison of Willems method, the CA and the correlation between DA and CA of the study population.

	N	Age		Paired difference		Spearman rank correlation
		Mean	SD	Mean	SD	
CA	60	11.7	2.2	0.5	1.2	r=0.830 P<0.001
DA	60	11.2	1.8			
Male						
CA	30	11.28	1.91	0.330	1.045	r=0.847 P<0.001
DA	30	10.95	1.86			
Female						
CA	30	12.07	2.35	0.603	1.417	r=0.801 P<0.001
DA	30	11.47	1.70			

Discussion

Although various age assessment methods showed high degrees of reliability, population differences were found to affect the accuracy resulting in overestimation or underestimation of the DA. In 2001, Willems et al. 8 evaluated the accuracy of Demirjian's method in Belgian Caucasian population and modified the scoring system. There exists variations in tooth development among populations and these differences are valid between several ethnic groups. Therefore, this study was performed to compare the DA assessment in children of South Kerala origin using the Belgian-Caucasian standard from Willems' study.

The overall mean difference between the estimated DA and CA was 0.5±1.2 years; with a gender variation of 0.330 ± 1.045 years for males and 0.603 ± 1.417 years for females. The present study underestimated the mean age of the entire study population by 0.5 years; by 0.3 years for males and by 0.6 years for females which were statistically not significant (P > 0.05). This gender differences may be due to the fact that Willems method gives separate standards for each sex, accounting for sexual differences. When the entire sample was considered, underestimation of age was noted, in agreement with previous studies.6,11,12. These differences can be explained by the difference in sample size, method of age calculation, the age and sex distribution of the original study population and statistical methodologies.

In the present study, Willems method was better applied for males when compared with females, which is in agreement with previous studies 6, 7. In contrast to previous studies,7,9,13,14, the present study underestimated the age. This delay in dental maturation may be partly explained by the environmental factors, genetic variations, population differences etc. This study also showed a significant correlation between DA and CA in both males (r = 0. 0.847) and females (r =0.801) and in the entire sample (r=0.830).

No age estimation technique exists which will accurately determine the exact CA for every individual because of the developmental variation between individuals. DA will not be the same for all children of a specific known age. It is also important to remember the fact that we cannot rely solely on a single method for DA estimation, but to apply different techniques available and perform repetitive measurements and calculations.

Conclusion

Determination of the dental age using radiograph plays an important role in assessing the chronological age when it is under dispute; which may bear implications in forensic, legal and social issues. Willems method of age estimation appears to be an appropriate method which can be applied to children below 16 years. The underestimation of age which was noted in our population may be related to the delayed dental maturity compared to Belgians. In

References

1. Liversidge, H. M. (2012). The assessment and interpretation of Demirjian, Goldstein and Tanner's dental maturity. Annals of human biology, 39(5), 412-431.
2. Williams, G. (2001). A review of the most commonly used dental age estimation techniques. J Forensic Odontostomatol, 19(1), 9-17.
3. Demirjian A, Buschang PH, Tanguay R, Patterson DK.(1985). Interrelationships among measures of somatic, skeletal, dental, and sexual maturity. Am J Orthod; 88:433-8.
4. Cunha E, Baccino E, Martrille L, Ramsthaler F, Prieto J, Schuliar Y, et al. (2009).The problem of aging human remains and living individuals: A review. Forensic Sci Int; 193:1-13.
5. Demirjian A, Goldstein H, Tanner JM.(1973). A new system of dental age assessment. Hum Biol; 45:211-27.
6. Maber M, Liversidge HM, Hector MP.(2006). Accuracy of age estimation of radiographic methods using developing teeth. Forensic Sci Int; 159 Suppl 1:S68-73.
7. Rai B, Anand SC. (2006). Tooth developments: accuracy of age estimation of radiographic methods. World J Med Sci ;1:130-2.
8. Willems G, Van Olmen A, Spiessens B, Carels C. (2001). Dental age estimation in Belgian children: Demirjian's technique revisited. J Forensic Sci; 46:893-5.
9. Mani SA, Naing L, John J, Samsudin AR. (2008).Comparison of two methods of dental age estimation in 7-15-year-old Malays. Int J Paediatr Dent; 18:380-8.
10. EL Bakary AA, Hammad SM, Ibrahim FM. (2009). Comparison between two methods of dental age estimation among Egyptian children. Mansoura J Forensic Med Clin Toxicol ;17:75-86.
11. Liversidge HM. Dental age revisited. In: Irish JD, Nelson GC, editors. (2008). Technique and Application in Dental Anthropology. Cambridge: Cambridge University Press;. p. 234-52.
12. Cameriere R, Ferrante L, Liversidge HM, Prieto JL, Brkic H. (2008).Accuracy of age estimation in children using radiograph of developing teeth. Forensic Sci Int; 176:173-7.
13. Grover S, Mohan C, Avinash J, Pruthi N. (2011). Dental age estimation of 6-15 year old North Indian children using Willems method.; Revista Latinoamericana de Ortodoncia y Odontopediatría Depósito Legal Nº: pp200102CS997-ISSN: 1317-5823:1-11.
14. Galić I, Vodanović M, Cameriere R, Nakaš E, Galić E, Selimović E, et al. (2011).Accuracy of Cameriere, Haavikko, and Willems radiographic methods on age estimation on Bosnian-Herzegovian children age groups 6-13. Int J Legal Med ;125:315-21.