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Original Research Paper

COMPARISON OF THE CHRONOLOGICAL AGE WITH DENTAL AGE AND SKELETAL AGE-BY: A RADIOGRAPHIC STUDY

Orthodontology

KEYWORDS: Hand-wrist maturation, Skeletal maturity, Chronological age,

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ABSTRACT

The purpose of the study was to compare skeletal age using and hand-wrist radiographs and to find the correlation amongst the skeletal, dental and chronological ages. One hundred healthy children in the age 9-16 years, were included in the study. hand-wrist of the right hand and opg were taken. Skeletal age was assessed hand-wrist radiographs according to the standards of Bjork, Grave and Brown Dental age was estimated by Demirgian method from orthopantomogram. Males and females both exhibit early dental development and females showed delayed skeletal maturation

INTRODUCTION

Considerable variations in development among children of the same chronological or calendar age have led to the introduction of the concept of developmental or physiological age .[1] Different authors have advocated various methods for determining skeletal maturity based on radiographs of specific structures.These skeletal methods present some inconveniences in view of the variability of bone maturation, as influenced by environmental factors[2].The hand-wrist radiograph was one of the most commonly used tools for skeletal developmental assessment[3]. Most investigators have found significant correlation among maturation stages derived from hand-wrist radiographs, changes in height during pubertal growth period, and facial growth[4-10].Orthopantomogram enables the viewing of both maxillary and the mandibular arches with their supporting structures. They are particularly useful in assessing the development and path of eruption of teeth, to assess any ankylosed or impacted teeth and to diagnose the presence and extent of any pathology of the jaws. It has been shown that dental parameters are more suitable for age estimation in children[11-15]because the variability is lower since calcification rates are more controlled by genes than by environmental factors[16]. The age-related changes in the dentition could be divided into three categories: formative, degenerative and histological. The formative or developmental changes are good predictors of age in the years until adulthood. A method discussed by Demirijian[17,18] and his co workers describes The scoring criteria based on the maturation stages of 7 teeth. The use of dental age estimation methods has gained importance because the teeth do remain as the last tissue to get disintegrated in the human body.So the study was conducted to compare the chronological age with skeletal and dental age and also to compare the dental and skeletal age.

MATERIAL & METHOD:

The sample was selected from patients undergoing treatment at the Department of Orthodontics and dento-facial orthopedics. 100 patients were selected between the age of 9 years and 16 years. (50 boys and 50 girls)Males and Females are further divided in to <13 years and >13 years age group.Mandibular left quadrant was screened which was followed by mandibular right quadrant and it was made sure that at least one quadrant was free from any pathology, only then these patients were selected for the study. Subject chronological age ranging from 9 to 16 years with intact hand wrist and facial skeleton, mandibular central incisor to mandibular second molar should be either erupted or under stages of eruption were selected.Subject with Normal growth and dental development ,no missing teeth or supernumerary teeth,No congenital oral or maxillofacial anomalies were included in the study group. The patient's panoramic radiograph and hand wrist radiograph were obtained by using the radiographic machine manufactured by X Mind Pano D+, Soredex, PaloDEx Group Oy Nahkelantie 160 FI-04300 Tuusula, Finland. These radiographs were assessed with a radiographic illuminator to ensure contrast enhancement of teeth and bone images. Magnifying glass was used where ever necessary for interpreting the radiographs. The X-ray machine has predetermined exposure setting which was devised on basis of individual's maturation status. . In the present study, clinical and radiographic pre-treatment data of 50 males and 50 females ranging in age from 9-16 years, having full set of permanent teeth except third molars were collected. Dental age was estimated by Demirgian method from orthopentomogram, while skeletal age was determined from hand-wrist radiograph by a method suggested by Bjork, Grave and Brown[19]. Comparison amongst the three ages were done.

RESULTS

Mean and standard deviations of each parameter for each Class were generated in excel® spread sheets and then transferred to the SPSS® (Statistical Package for the Social Sciences) software version 18.0. Student's paired t was counducted The findings described in following tables

Table 1 -Comparison of Chronological Age, Dental Age and Skeletal Age in Males 9yrs to 16 yrs

	Age	Mean	Std. Deviation	Std. Error Mean	Mean Difference	P value
Below 13 years age N=28	Chronological age	11.577	1.162	0.248	-0.577	0.015
	Dental age	12.155	1.718	0.366		
	Chronological age	11.577	1.162	0.248	-0.459	0.005
	Skeletal age	12.036	1.088	0.232		
	Dental age	12.155	1.162	0.366	0.118	0.118
	Skeletal age	12.036	1.088	0.232		
Above 13 years ageN=22	Chronological age	14.418	0.955	0.181	-0.496	0.021
	Dental age	14.914	1.128	0.213		
	Chronological age	14.418	0.955	0.181	0.739	0.001
	Skeletal age	13.679	1.368	0.259		
	Dental age	14.914	1.128	0.213	1.236	<0.0001
	Skeletal age	13.679	0.955	0.181		

Table 2-Comparison of Chronological Age, Dental Age and Skeletal Age in Females 9yrs to 16 yrs

	Age	Mean	Std. Deviation	Std. Error Mean	Mean Difference	P value
Below 13 years age N=28	Chronological age	11.73	0.784	0.164	-0.67	0.005
	Dental age	12.4	1.057	0.22		
	Chronological age	11.73	0.784	0.164	1.952	<0.0001
	Skeletal age	9.778	1.052	0.219		
	Dental age	12.4	1.057	0.22	2.622	<0.0001
	Skeletal age	9.778	1.052	0.219		
Above 13 years ageN=22	Chronological age	14.248	0.869	0.167	-0.233	0.126
	Dental age	14.481	1.091	0.21		
	Chronological age	14.248	0.869	0.167	1.226	<0.0001
	Skeletal age	13.022	1.351	0.26		
	Dental age	14.481	1.091	0.21	1.459	<0.0001
	Skeletal age	13.022	1.351	0.26		

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DISSCUSSION

Among the diagnostic tools available, hand-wrist radiographs have been used extensively and reliably to assess the skeletal maturity and predict the pubertal growth spurt [4,5,20,21]. Several methods have been developed to assess the dental age according to the degree of calcification observed in permanent teeth[22]. The method described by Demirjian et. al.[18], which was utilized in the present study, has been extensively used in the literature to assess the dental maturation and determine the dental age.[23,24,25,26].Variations of dental and skeletal ages from known chronological age indicate changes in the standard growth pattern.[27] In our population both the genders exhibit delayed skeletal development than chronological and dental development. This is may be due to nutritional deficiency[28-30] life-styles, and socioeconomic status.[31] In the present study, Comparison amongst the three ages were done. As shown in Table No. 1, in males below 13 years while comparing Chronological Age,Dental Age (p=0.015) and Skeletal Age(p=0.005), there is significant difference between Chronological Age - Dental Age (p=0.015) and Chronological Age - Skeletal Age (p=0.005). But there is no significant difference between Dental Age and Skeletal Age. Male below 13 years show early dental development by about 6 months and skeletal development by about 5 months than chronological age. There is no significant difference between skeletal and dental age, i.e. skeletal and dental development in this group occurs in a parallel manner.While there is significant difference amongst all the three ages in males above 13 years of age. Skeletal age is the least amongst all three ages and dental age is the highest. On an average, dental development is 15 months ahead of the skeletal development which is less than the chronological age by mean value of 8 months.

Table No. 2 is showing highly significant differences (p<0.0001) between Chronological Age - Skeletal Age and Dental Age - Skeletal Age in females below 13 years. Dental development in this group is about 31 months ahead of the skeletal development while skeletal maturation also is delayed by mean value of 2 years than the chronological age. Dental development is about 7 months earlier with respect to the chronological age. Dental development is the earliest in this age group. This is favorable to start orthodontic treatment earlier in girls, as the premolars erupts earlier, more permanent teeth can be incorporated and settled during growth modulation procedures. While females above 13 years showed highly significant difference (p<0.0001) in comparision between Chronological Age - Skeletal Age and Dental Age –Skeletal Age. But there is no significant difference between Chronological Age - Dental Age. Skeletal age is about 16 months lower than dental age and about 14 months lower than chronological age.

CONCLUSION

Males and females both exhibit early dental development and females showed delayed skeletal maturation too.Dental and skeletal development in males below 13 years occurs in parallel manner .Chronological and dental development in females above 13 years happens in unison. Female below 13 years and males above 13 years show significant difference amongst all the three ages.Females above 13 years exhibit remarkably delayed skeletal maturation than age progression and dental development.

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