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Evaluate and compare dental age with chronological age in hyperdivergent and hypodivergent growth pattern

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Abstract---*Aim:* To evaluate and compare dental age with chronological age of different facial patterns in growing patients. *Materials and method:* This study comprises of lateral cephalogram and panoramic radiographs of 100 subjects. Subjects were classified into two groups of 50 each on the basis of angular and linear measurements Group I – Hypodivergent and Group II – Hyperdivergent growth patterns respectively. Comparison between intergroups and within intragroup is made by using t –test. *Result:* Statistically significant results were obtained while comparing dental age with chronological age in hyperdivergent and hypodivergent subjects indicating hyperdivergent group had more advance dental age than hypodivergent. *Conclusion:* Orthodontic therapy should be started earlier in patients with hyperdivergent growth pattern than those with hypodivergent growth pattern.

Keywords---Chronological age, Dental age, Hyperdivergent, Hypodivergent

Introduction

“A Real intelligence is an art to simplify complex matters without losing the integrity of that matter”. “Growth” is one such complex phenomenon. In orthodontics knowledge of growth of various facial patterns is essential in diagnosis and treatment planning and is critical in the development of balanced dentofacial structures like maxilla and mandible. Various studies by Schudy, Issacson, Sassouni, Opdebeeck have focused on how Individuals follow different growth patterns and also exhibit different rates of maturation.¹⁻⁵ Two commonly encountered extreme facial growth patterns Schudy defined the former condition “hypodivergent” and the latter as “hyperdivergent” growth pattern.^{1,2} Individuals with different facial dimensions varies considerably relative to the circum pubertal growth spurt, jaw morphology, rotational pattern & dental maturation. Orthodontists are very much interested in facial growth and development and the associated dental and skeletal abnormalities. Proper knowledge of dental developmental pattern in different facial types in a particular population can help an orthodontist during treatment planning. Dental maturity is determined by the stage of tooth eruption or by the stage of tooth formation by using Demirjian’s method⁶ because of its simplicity & universal acceptance.⁷⁻¹² Hence the purpose of this present study is to evaluate dental age in extreme facial patterns and to compare it with chronological age to evaluate the growth status.

Materials and Method

The data for this study has been obtained from the patients who visited the Department of Orthodontics and Dentofacial Orthopaedics, Guru Nanak Dev Dental College and Research Institute, Sunam. Lateral cephalogram and Panoramic radiographs of 100 subjects were obtained between age group of 9-13yrs. Lateral cephalogram is traced manually on acetate matte sheet by using 3H pencil. Various linear and angular measurements were taken to classify subjects equally into two groups as- Group I -Hypodivergent and Group II – Hyperdivergent growth patterns. Linear measurements include Jaraback’s Ratio (62- 65%) and Angular measurements include SN-GoGn (32 degree), FMA (25 degree) and Y-axis (53 degree to 66 degree). Chronological age is determined by using patient’s date of birth.

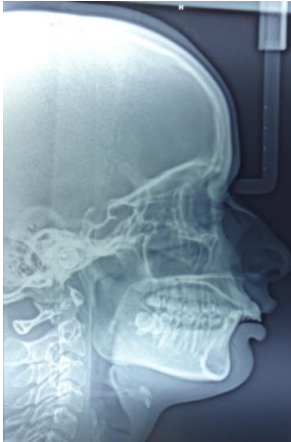


Figure 1 & Figure 2 represent lateral cephalogram & Orthopantomogram of Hypodivergent growth pattern.



Figure 3 & Figure 4 represent Lateral cephalogram & Orthopantomogram of Hyperdivergent growth pattern.

After categorising the patients into two groups, dental age is calculated in both the groups from orthopantomogram by using Demirjian's method of dental age estimation.⁶ The stage of calcification of permanent teeth in the mandibular left quadrant is analysed beginning from central incisor to second molar on panoramic radiographs. Maturity scores of all seven teeth were recorded and then added together to give total maturity score. This total score is finally converted into dental age using tables given by Demirjian.⁶ Data obtained is statistically analysed by using T-test.

Results

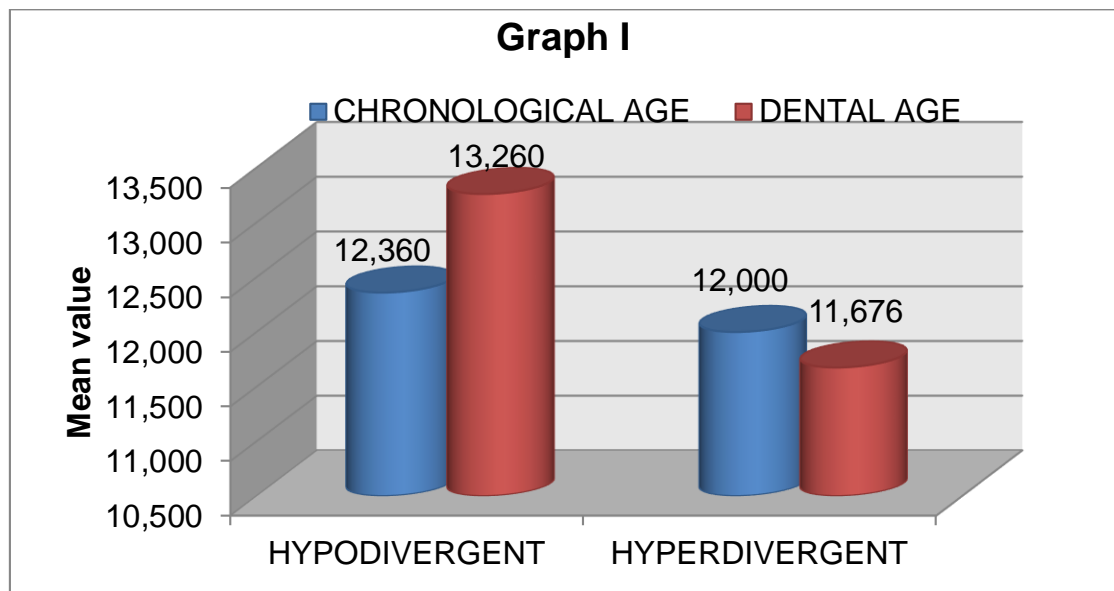
Comparison between different facial pattern were done and statistically significant difference was obtained. Paired T -test was used for intragroup comparison between dental age and chronological age and unpaired T-test was used for inter group comparison. P-value of < 0.05 considered significant The results of the

present study showed that hyperdivergent group had more advanced dental age than hypodivergent group indicating early maturation in both male and female subjects of hyperdivergent group whereas hypodivergent group showed delayed dental maturation in both male and female subjects.

Comparison of dental age with chronological age (intragroup comparison)

TABLE I : Paired 't' test: NS: $p > 0.05$; Not significant; * $p < 0.05$; Significant; ** $p < 0.001$; Highly significant

	N	CHRONOLOGICAL AGE		DENTAL AGE		P VALUE
		MEAN	SD	MEAN	SD	
HYPODIVERGENT	25	12.360	0.860	13.260	1.053	**
HYPERDIVERGENT	25	12.000	0.957	11.676	1.022	*

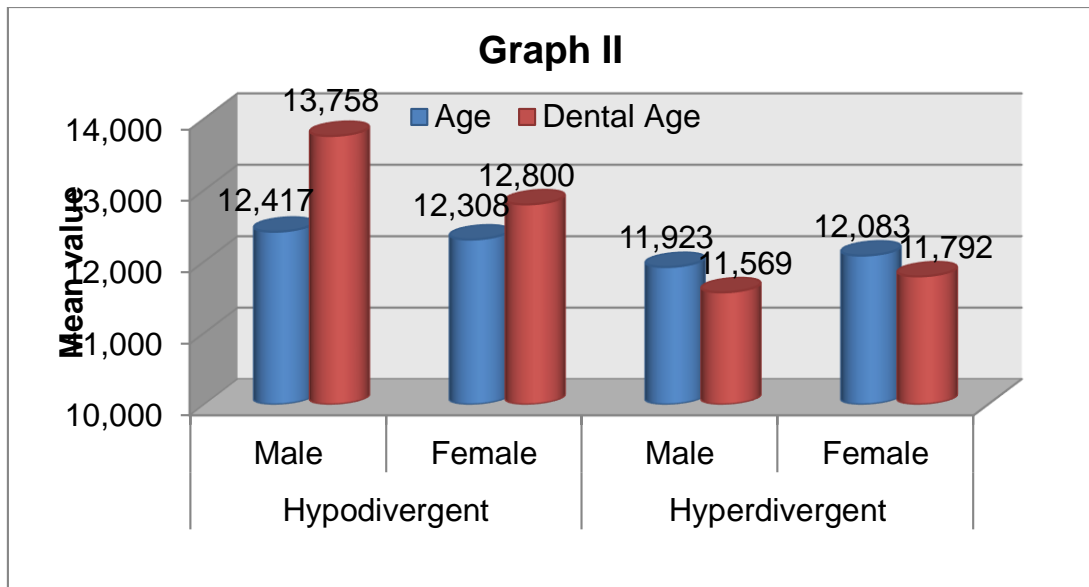


From table I & Graph I it was shown that, dental maturation is significantly late ($13.26 > 12.36$) as compared to chronological age in hypodivergent group whereas in case of hyperdivergent group dental maturation is significantly ahead ($11.67 < 12.00$) of chronological age.

Comparison of dental age with chronological age in hypodivergent and hyperdivergent groups in males and females (intragroup comparison)

TABLE II : Paired 't' test: NS: $p > 0.05$; Not significant; * $p < 0.05$; Significant; ** $p < 0.001$; Highly significant

		N	Age		Dental Age		P value
			Mean	SD	Mean	SD	
Hypodivergent	Male	12	12.417	0.793	13.758	0.892	**
	Female	13	12.308	0.947	12.800	1.005	*
Hyperdivergent	Male	13	11.923	0.862	11.569	1.053	*
	Female	12	12.083	1.084	11.792	1.020	NS

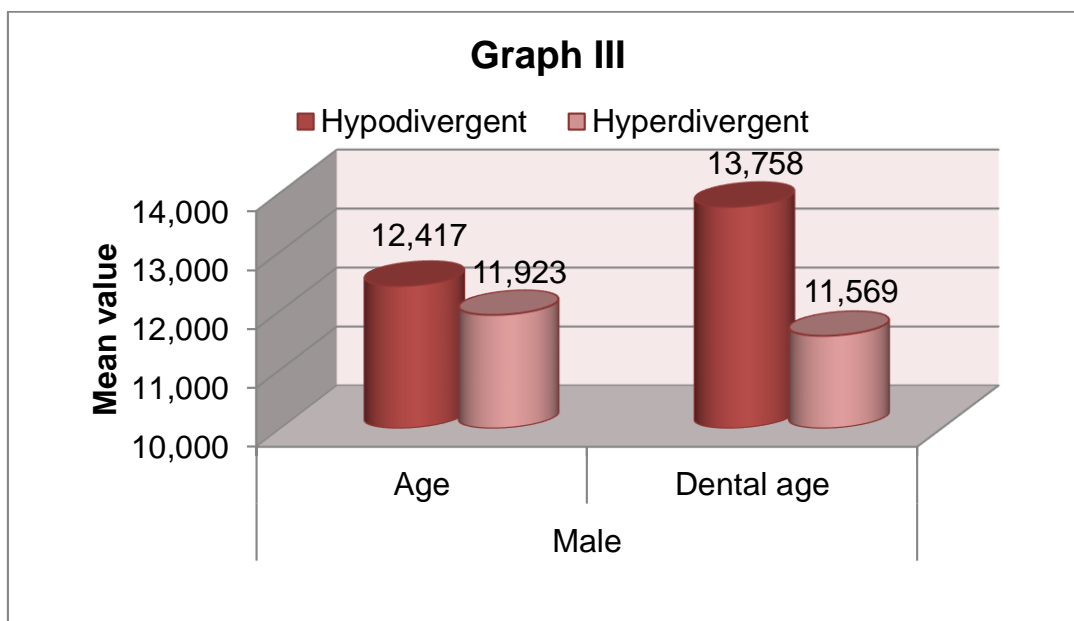


From the table II & Graph II it was shown that in hypodivergent pattern dental maturation is significantly late as compared to chronological age in both males (12.41<13.75) and females (12.30<12.80) whereas in hyperdivergent pattern dental maturation is significantly ahead of chronological age in both males (11.92>11.56) and females (12.08>11.79).

Comparison of dental age of males in hypodivergent and hyperdivergent groups (intergroup comparison):

TABLE III : Unpaired 't' test: NS: $p > 0.05$; Not significant; * $p < 0.05$; Significant; ** $p < 0.001$; Highly significant

		Hypodivergent			Hyperdivergent			P value
		N	Mean	SD	N	Mean	SD	
Male	Age	12	12.417	0.793	13	11.923	0.862	NS
	Dental age	12	13.758	0.892	13	11.569	1.053	**

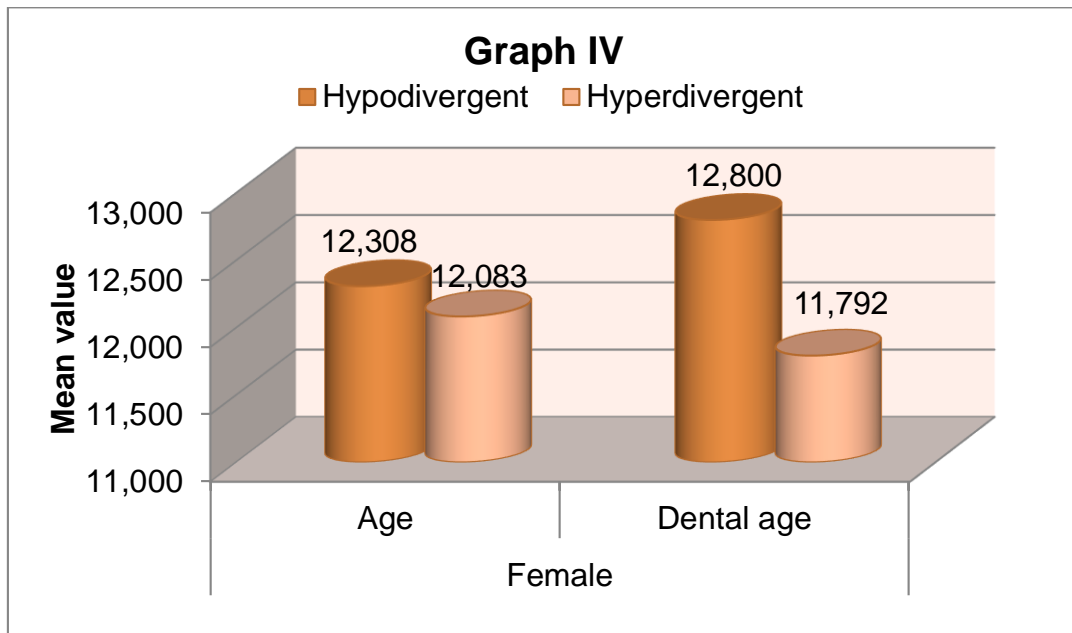


From the table III & graph III it was shown that in males, dental maturation is significantly ahead ($11.56 < 13.75$) in hyperdivergent group than in hypodivergent group.

Comparison of dental age of females in hypodivergent and hyperdivergent groups (intergroup comparison)

TABLE IV : Unpaired 't' test: NS: $p > 0.05$; Not significant; * $p < 0.05$; Significant; ** $p < 0.001$; Highly significant

		Hypodivergent			Hyperdivergent			P value
		N	Mean	SD	N	Mean	SD	
Female	Age	13	12.308	0.947	12	12.083	1.084	NS
	Dental age	13	12.800	1.005	12	11.792	1.020	*



From the table IV & graph IV it was shown that in females, dental maturation is significantly ahead ($11.79 < 12.80$) in hyperdivergent group than in hypodivergent group.

Discussion

Facial pattern has a valuable impact on diagnosis and treatment planning in orthodontic patients. It serves as a reference landmark for esthetics and beauty of face in general. The present study was to determine dental age & compare it with chronological age in different facial pattern to evaluate the growth maturation status. For this purpose a total of 100 subjects were considered between the age group of 9-13 years with group – I consisting of 50 subjects with Hypodivergent and group – II consisting of 50 subjects with Hyperdivergent facial pattern. The chronological age is taken as per determined by the patient as per his/her date of birth. Dental age is determined by Demirjians method.⁶ Result of the present study demonstrate a statistically significant difference between dental development of subjects indicating early maturation in hyperdivergent group when compared with hypodivergent group. The hyperdivergent patient has mean chronological age of 12.00 years and mean dental age of 11.67 years; Hypodivergent group has mean chronological age of 12.36 years and mean dental age of 13.26 years as observed from table I. More advance dental age was observed for hyperdivergent group than hypodivergent group. Females of hyperdivergent group had a mean chronological age of 12.08 years and mean dental age of 11.72 years; females of hypodivergent group had a mean chronological age of 12.30 years and mean dental age of 12.80 years and males of hyperdivergent group had a mean chronological age of 11.92 years and mean dental age of 11.56 years; males of hypodivergent group had a mean chronological age of 12.41 years and mean dental age of 13.75 years as shown in table II III & IV

representing early dental maturation in males & females of hyperdivergent group than hypodivergent group.

The explanation for earlier dental maturation of subjects with vertical growth patterns in comparison to those having horizontal growth is based mainly on the intrinsic characteristics of each of these facial types and also genetic aspects.^{12,13} Various studies had been conducted by various researchers like Gottimukkala P, Goyal V, Verulkar A and Kamble RH etc. all determining early dental maturation in vertical growers.¹⁴⁻¹⁷ Nanda^{18,20} observed that subjects with skeletal open bite and increased lower anterior facial height (LAFH) had earlier pubertal growth spurts than those with deepbite and reduced LAFH. Nanda and Rowe¹⁹ observed that subjects with skeletal open bite and increased LAFH had earlier maturation of craniofacial growth than subjects with deepbite and reduced LAFH. Janson et al.¹¹ also investigated the influence of facial type on dental development in subjects of the same chronological age. They showed that long face subjects presented a tendency to have an advanced dental maturation in comparison to short face subjects by 6 months. Naves et al.¹² compared the maturation stages of permanent teeth in subjects with vertical and horizontal growth pattern and concluded that subjects with vertical growth pattern had dental maturation earlier than the horizontal growers. Precocity of approximately 9 months was found in dental maturation of subjects with vertical growth patterns in relation to those with horizontal growth patterns. This difference is considered clinically significant when considering the treatment time. Thus the use of chronological age might misguide if individual growth patterns are not considered.

Conclusion

Patients with predominantly hyperdivergent growth pattern show advance dental age when compared with chronological age. This pattern is same for both male and female subjects because signs of pubertal growth spurt appear earlier in children with vertical growth pattern.

Clinical implications

The clinical implication of the study permits us to conclude that orthodontic therapy should be started earlier in patients with hyperdivergent growth pattern than those with hypodivergent growth pattern.

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