Dento-Skeletal dimensions in individual with skeletal CL I and variations in the lower anterior facial height

Dr. Sami K. Al. Joubori B.D.S. , M.SC

Abstract

Aims of the study: This study is designed to evaluate some of the dental and skeletal dimensions of individuals with normal and excessive lower anterior facial height and to establish the effect of these two groups (normal and excessive lower anterior facial height) on dento-facial structures for Iraqi adult sample at 18-25 years of age with skeletal and dental CL I occlusion.

Material and Method: The sample consisted of (80) previously taken lateral cephalometric radiographs (40 males and 40 females).The sample was divided into two groups (normal lower anterior facial height group and excessive lower anterior facial height group) each of them composed of 40 subjects (20 males and 20 females)

Results: The results showed that all linear measurements were significantly larger in males than females in two groups. No significant differences in most of dento-skeletal dimensions were found between the two groups. Highly significant differences for lower anterior dental height (LADH) and upper posterior dental height (UPDH) were found between the two groups.

Conclusion: Four anatomical parts were responsible for the variation of the lower anterior facial height upper anterior dental height (UADH) , lower anterior dental height (LADH) , upper posterior dental height (UPDH) and the inclination of the mandibular plane in relation to the anterior cranial base (SN-MP angle).

Introduction

The description of the dento-facial relationship of people with normal and abnormal facial morphology is one of the most common subjects in orthodontic literature[1,2].

Due to the large variation that in the exists in the population, many studies have been made to describe the variations of the human face, including a system that identifies the various facial types, this classification is of great importance in the diagnosis and treatment planning of craniofacial and dental discrepancies (3).

The facial type (short, average and long faces) in relation to morphological characteristics is an important factor to be considered in orthodontic treatment, because facial type influences growth predication of the maxillofacial system in the anchorage system that is used during treatment for the goals of orthodontics treatment(4).

There is a negative correlation between the average growth rate of the upper anterior face height with the lower anterior face height suggesting that some children show accelerated growth in the lower face height in the relation to the upper face height and vice versa(5).

The effect of orthodontic treatment on the lower face height (ANS-Me) is a factor of great importance, to be confirmed by the orthodontist, however, the facial type should be considered when planning treatment with or without extraction.(6) Lower anterior face proportion used to demonstrate that non extraction treatment showed downward and backward rotation of the mandible and an increased lower face height. On the

other hand, extraction treatment is not associated with change in the ANS-Me measurements.

The anterior face proportion is an instrument could be used in the orthodontic diagnosis, instead of using only numerical vertical measurements (7).

Creekmore (8) said that any one technique or philosophy of treatment is inadequate, when used without consideration of the facial type of the patient. The vertical growth should be stimulated or inhibited i.e. redirected according to the needs of the individual patient. Thus, the importance of knowledge of facial types and their characteristics in relation to the growth pattern is clear.

Material and Method

The sample consist of eighty lateral cephalometric radiographs (40 males and 40 females) that previously taken in orthodontic department at the College of Dentistry of Baghdad University.

In the selection of the sample were skeletal class I (ANB angle between 0-4 degree(9), bilateral class I canine and molar relation-ships, full set of permanent teeth excluding third molar, no history of abnormal habit , no history of previous orthodontic treatment or maxillofacial surgery and no clear facial asymmetry.

The sample was divided into two groups according to facial third proportions obtained by linear measurements of anterior face height (N-Me) and lower anterior face height (ANS-Me) based on the measurements suggested by Wylie and Johnson (1952) with the proportion of 55% for (ANS-Me) distance. (ANS-Me) values were defined ranging from (55%-56%) for the normal lower anterior face height group, values greater than 56% for the excessive lower anterior face height

group. The groups were composed of 40 subjects (20 males and 20 females) in the normal lower anterior face height group and other 40 subjects (20 males and 20 females) in the excessive lower anterior face height group.

Cephalometric landmarks:-

The following cephalometrics landmarks were used in this study according to Enoki (17):

- Sella (S) (center of sella turcica)

-Nasion (N) – Anterior point on the frontonasal suture

-Point A – Deepest point on the concave outline of the upper labial alveolar process.

-Point B –The deepest point on the bony curvature between the crest of the alveolus and the pogonian.

-Anterior nasal spine (ANS) –The tip of the anterior nasal spine

- Posterior nasal spine (PNS) – The tip of the posterior nasal spine.

-Point Is (Is) – maxillary incisal edge.

- Point Ii (Ii) – mandibular incisal edge.

- Point 6s (6s) – mesiobuccal cusp of the upper first molar.

- Point 6i (6i) – mesiobaccal cusp of the lower first molar.

- Menton (Me) – The lowest point on the lower border of the mandibular symphysis

- Gonion (Go) – The mid point at the angle of the mandible.

- Articulare (Ar) – Intersection of the lateral radiographic image of the posterior border of the ramus with the occipital bone.

Measurement technique

The following cephalometric measurements were taken according to (12).Fig (1,2)

1- N-Me (anterior facial height)

2- ANS-Me (lower anterior face height)

3- Go-Me (mandibular length)

4- ANS-PNS(Maxillary length)

5- Ar-Go (ramus height)

6- UADH (upper anterior dental height) linear distance from the incisal edge of the maxillary central incisor along a perpendicular to the palatal plane.

7- LADH (lower anterior dental height) linear distance from the incisal edge of the mandibular central incisor along a perpendicular to the mandibular plane.

8- UPDH (upper posterior dental height). Height of the maxillary first molar measured as a perpendicular to the palatal plane through the mesiobuccal cusp.

9-LPDH (lower posterior dental height): Height of the mandibular first molar measured as a perpendicular to the mandibular plane.

10- SN-OCCP: angle formed by the intersection of (SN) and the occlusal plane (OCCP)

11-SN-MP: angle formed by the inclination of the mandibular plane (GO-Me) in relation to the anterior cranial base (SN)

12-Is-PP: angular measure formed by the intersection of the maxillary incisors in relation to the palatal plane.

13- Ii-MP: angular measure formed by the intersection of the mandibular incisors in relation to the mandibular plane.

14-ANB angle: angle formed by the intersection of N-A and N-B.

Results

The result showed that the mean values were greater in males than females for all linear measurements for the normal group with a highly significance except upper anterior dental height (UADH) and upper posterior dental height (UPDH) were a non significant difference between them while the angular measurement showed a non-significant difference between males and females except (SN-OCCP) which appeared with a significant difference with females more than males. (Table -1-)

Concerning the excessive large lower anterior facial height group, the results showed a larger mean values for males than females with a highly significance for most linear measurements except lower posterior dental height (LPDH) and upper anterior dental height (UADH) were only a significant difference. But there was a no significant difference between both genders for angular measurements. (Table-2-)

Table-3- showed the comparison of significance between two groups for each gender and total sample, concerning the difference between the two groups (for males): the results showed a non-significant difference for most of variable except (ANS-Me), (LADH),(UADH),(UPDH) which appeared with a highly significant difference with larger mean values in the excessive lower anterior facial height group. While the difference between the two groups (for females).

The result showed a non-significant difference for most variable except (LPDH), (UADH) which appears a significant difference while (ANS-Me), (LADH) showed a highly significant difference with a greater mean values for excessive lower anterior face height group.

The difference between the two groups (for total sample): The result showed a non-significant difference for most variables except (ANS-Me), (LADH), (UPDH) which appearance with a highly significant difference and (SN-MP) with only a significant difference with a greater mean values in the excessive lower anterior face height group.

Discussion

The vertical facial growth pattern is a very important factor to consider in orthodontic treatment, especially with reference to the dental and skeletal characteristics of facial types in relation to the lower face height.

The results showed that males in both groups had a larger facial and dental linear dimensions than females and this comes in agreement with Coben (11,12) who explained that males had a larger facial proportion than females also it comes in agreement with profit(13) who reported that males showed highly significant values for all vertical planes indicating larger facial proportions.

Comparison of the skeletal linear measurements:

The results showed that there was a no significant difference in the mandibular length (GO-Me) and the maxillary length (ANS-PNS) among the two groups, this indicating that the increase in the anterior lower facial height had no effect on both mandibular and maxillary length and this comes in agreement with (3,21), whom they found a non significant differences in the maxillary and mandibular length among the normal and long face groups.

The height of the mandibular rami was not significantly different among the two groups, demonstrating that this linear measurement does not influence the dimensions of the lower anterior face height as concluded by Nanda (15) who reported that posterior face height and ramal height do not significantly differ between facial types. Concerning the total anterior face height (N-Me) , no significant between the two groups although there was a larger mean values for long face group in contrast to Fields et al (1) study who found that total anterior face height are

significantly larger in long face than in normal faces

Comparison of the dental linear measurements:-

For UADH and LADH, there was a highly significant differences between the two groups with a larger mean values for the excessive lower anterior facial height group than the normal group for both genders and total sample and this comes in agreement with (7,16,17) whom observed that all anterior dental heights were larger in the group with excessively larger lower anterior face height compared to the normal group.

For UPDH and LPDH, the results showed a greater mean values for both UPDH and LPDH in the excessive lower anterior facial height group compared with normal group and this difference is ranged between a not significant for LPDH when we compare between total normal and total excessively large lower anterior face height. While it was showed a highly significant for UPDH when we compared between total normal and total excessively larger anterior face height and this comes in agreement with (1) who observed that posterior dental heights were larger in the long face type compared with the normal type.

Comparison of skeletal Angular measurements:-

There was no significant differences of the SN-MP angle between the two groups for both genders but when we compare between the total sample, the result, showed a significant differences with larger mean values for excessive group and this comes in agreement with(1) who found, in long face, the (SN-Mp) angle is significantly larger than in normal faces. Also it comes in agreement with (18,19) who reported that the SN-MP

angle can not be the sole criterion in the selection and diagnosis of long face. Concerning the SN-OCCP angle, there was no significant difference between the two groups, in agreement with the findings of Nanda (20).

Comparison of the Dental Angular Measurements:-

The axial inclination of the upper and lower central incisors of the present study showed no significant differences, in contrast to the findings of (14,21) who observed more tendency toward accentuated dental axial inclinations in the normal lower face height group than in the group with long faces, suggesting a more tendency toward uprightening position of the incisors in the normal group.

It was possible to conclude that four anatomical parts were responsible for the variation of the lower anterior facial height. UADH, LADH, UPDH, SN-MP angle. There fore these measurements may indicate the variation of the lower anterior face height rather than only the analysis of the proportion of the anterior facial height.

References

1- Fields HW, profit WR, Nixon WL, Phillips C, stanek E.: Facial pattern differences in long. Facial children and adults, Am .j. orthod. (1984) 85:217-223.

2- Scheidman GB, Bell WH, Legan HL, Finn RA , Reisch JS.: Cephalometric analysis of dento facial normals. Am .j. ortho. (1980)78: 404-420.

3- Bishara SE, Jakobsen MA: longitudinal changes in three normal facial types. Am .j. ortho. (1985) 88:466-502.

4- Tsunori M, Mashita M, Kasai K: relation ship between facial types and tooth and bone characteristics of the mandible obtained by CI scanning. Angle ortho. (1998) 68:557-562.

5- Ligthelm-Bakker ASWMAR, Wattel E, Uljee IH, Prahl-Andersen B.: Vertical growth of the anterior face: a new approach AM .j. orthod Dento fac. Orthop (1992) 101: 509-513.

6- Chua A. Lim Jys, Lubit EC.: The effects of extraction versus non extraction orthodontic treatment on the growth of the lower anterior face height. Am .j. orthod Dentofac. Orthop (1993) 104:361-368.

7- Janson GRP, Metaxas A, Woodside DG.: variation in maxillary and mandibular molar and incisor vertical dimension in 12- year- old subjects with excess, normal and short anterior face height. Am .j. orthod. Dentofac. Ortho 1994)106: 409-418.

8- Creek more TD: Inhibition or stimulation of the vertical growth of the facial complex, its significance to treatment. Angle orthod (1967) 37: 285-297.

9- Rakosi T. :An atlas and manual of cephalometric radiography. Wolfe medical publications LTD (1982).

10- Wylie WL, Johnson EL: Rapid evaluation of facial dysplasia in the vertical plane. Angle orthod (1952) 22: 165-182.

11- Coben SE: The integration of facial variations. A serial cephalometric roentgenographic analysis of craniofacial from and growth .Am .j. orthod (1955) 41:407-434.

12-Abdul Salam, R : Skeleto dental norms in a sample of Yemeni adults with class I normal occlusion. A thesis submitted to the college of Dentistry, University of Baghdad (2002).

13-Proffit W.R: Contemporary orthodontics. 3th Ed. St.Louis C.V. Mosby company (1986).

14- Opdebeeck H, Bell WH, Eisenfeld J, Mishelevich D.: comparative study between the SFS and LFS rotation as possible morphogenic mechanism . Am .J. orthod. (1978) 74: 509- 521.

15- Nande SK.: Patterns of vertical growth in the face. Am .J. orthod. Dentofac. Orthop. (1988) 93: 103- 116.

16- Schendel SA, Eisenfeld J, Bell WH, Epker BN, Mishlevich DJ.: The long face syndrome: Vertical maxillary excess. Am .j. orthod. (1976) 70: 398- 408.

17- Enoki C., Telles C.s., Matsumoto M.A.N: Dento-skeletal dimensions in growing individuals with variation in the lower facial height. Braz. Dent. J (2004) 15: 1- 10.

18- Skieller V, Bjork A, Linde- Hansen T.: Predication of mandibular growth rotation evaluated from a longitudinal implant sample .Am .j. orthod. Dentofac. Orthop. (1984) 86: 359- 370.

19- Lee RS, Daniel FJ, Swartz M, Baumrind S and Korn EL: Assessment of a method for the prediction of mandibular rotation, Am.

J. Orthod. Dentofac. Orthop. (1987) 91: 395- 402.

20- Nanda RS: Growth patterns in subjects with long and short faces,, Am. J. Orthod. Dentofac. Orthop. (1990) 98: 247- 258.

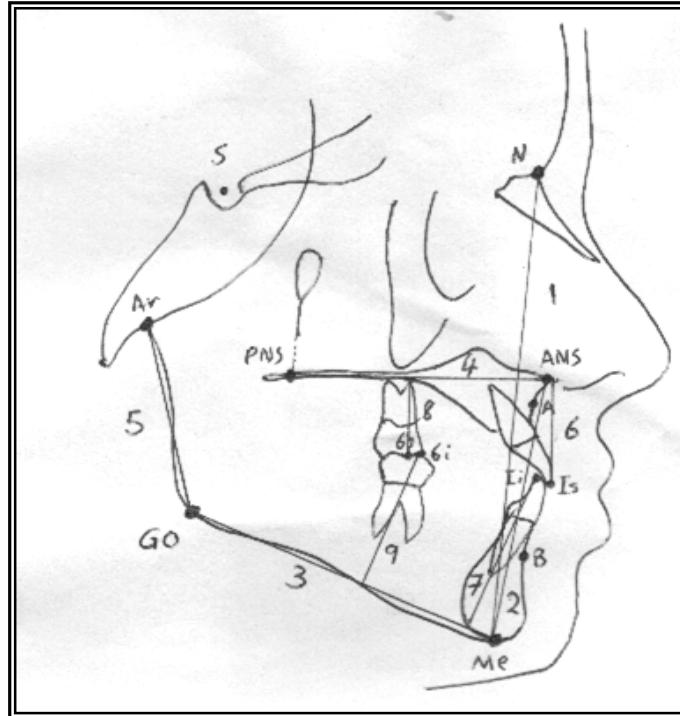21- Opdebeeck H and Bell WH: The short face syndrome, Am. J. Orthod. (1978) 73: 499- 511.
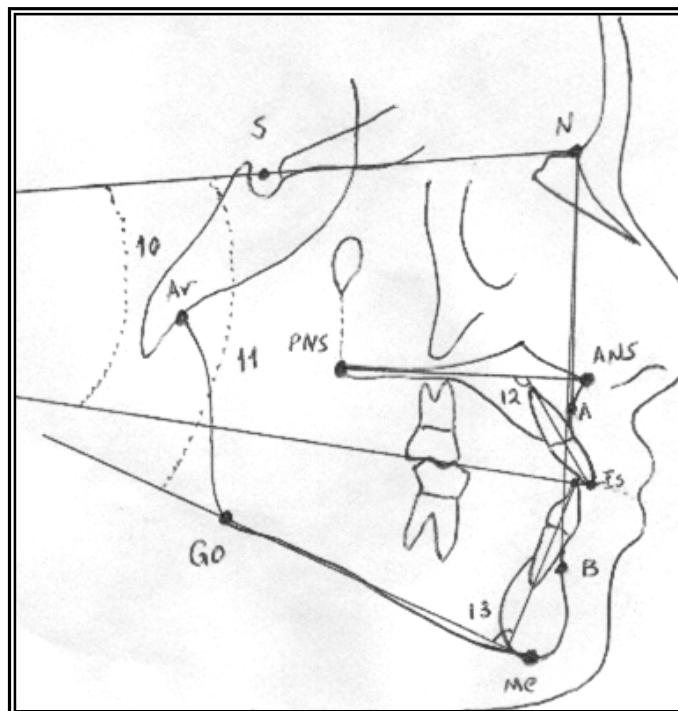
Figure (1): Dental and skeletal linear measurements.

Figure (2): Dental and skeletal angular measurements.

Table (1): A comparison of significance between males and females for normal group.

	Variable	Normal male		Normal female		Total normal		P- Value	Sig.
		Mean	S.D.	Mean	S.D.	Mean	S.D.		
Linear measurements	Go- Me	82.62	4.52	76.12	2.78	79.37	4.95	0.000	H.S.
	N- Me	139.12	7.12	129.65	4.52	134.38	7.60	0.000	H.S.
	ANS- Me	77.27	4.15	71.95	3.07	74.61	4.50	0.000	H.S.
	Ar- Go	57.40	5.11	50.72	4.78	54.06	5.94	0.000	H.S.
	LADH	47.72	2.78	43.72	2.36	45.72	3.25	0.000	H.S.
	LPDH	37.30	3.80	33.60	2.98	35.45	3.86	0.002	H.S.
	UADH	32.50	3.20	31.45	1.82	31.97	2.62	0.212	N.S.
	UPDH	27.10	2.19	25.80	2.06	26.45	2.20	0.062	N.S.
	ANS-PNS	56.85	3.16	54.05	2.96	55.45	3.34	0.006	H.S.
Angular measurements	SN- MP	32.55	6.94	35.62	4.93	34.08	6.14	0.116	N.S.
	SN- OccP.	15.12	4.09	18.25	4.33	16.68	4.45	0.024	S.
	Is- PP	116.50	7.86	113.80	6.15	115.1	7.09	0.234	N.S.
	Ii- MP	93.80	7.17	93.05	7.40	93.42	7.20	0.747	N.S.

H.S.= Highly significant at P< 0.01
S.= P< 0.05
N.S.= Not Significant at significant at P> 0.05
Number of individual= 40 person

Table (2): A comparison of significance between males and females for excessive lower anterior facial height group.

	Variable	excessive male		excessive female		Total excessive		P-Value	Sig.
		Mean	S.D.	Mean	S.D.	Mean	S.D.		
Linear measurements	Go- Me	81.40	3.71	75.15	4.17	78.27	5.02	0.000	H.S.
	N- Me	141.75	7.60	131.70	6.71	136.7	8.72	0.000	H.S.
	ANS-Me	82.70	4.62	77.42	5.58	80.06	5.72	0.002	H.S.
	Ar- Go	55.62	5.38	49.82	4.00	52.72	5.53	0.000	H.S.
	LADH	50.70	3.19	47.12	3.68	48.91	3.85	0.002	H.S.
	LPDH	37.90	2.51	36.00	3.27	36.95	3.03	0.047	S.
	UADH	35.45	3.06	33.05	2.92	34.25	3.20	0.016	S.
	UPDH	29.60	2.52	26.75	2.78	28.17	2.99	0.002	H.S.
	ANS-PNS	55.55	3.01	53.00	2.79	54.27	3.14	0.009	H.S.
Angular measurements	SN-MP	36.45	7.72	38.62	6.20	37.53	6.99	0.333	N.S.
	SN-OccP.	15.52	4.48	18.47	5.15	17.00	5.02	0.061	N.S.
	Is- PP	113.07	5.59	114.60	5.66	113.83	5.61	0.397	N.S.
	Ii- MP	93.45	5.45	93.20	7.61	93.32	6.53	0.906	N.S.

H.S.= Highly significant at P< 0.01
S.= Significant at P< 0.05
N.S.= Not significant at P< 0.05
Number of individual= 40 person

Table (3): A Comparison of significance between normal and excessive groups for   each gender and total sample:

Variables groups	Go-Me	N- Me	ANS-M	Ar-Go	LADH	LPDH	UADH	UPDH	ANS-PNS	SN-MP	SN-OccP.	IS- PP	Ii- MP
Normal male x excessive male	0.356 (N.S.)	0.265 (N.S.)	0.000 (H.S.)	0.292 (N.S.)	0.003 (H.S.)	0.560 (N.S.)	0.005 (H.S.)	0.002 (H.S.)	0.192 (N.S.)	0.101 (N.S.)	0.770 (N.S.)	0.122 (N.S.)	0.863 (N.S.)
Normal female x excessive female	0.391 (N.S.)	0.266 (N.S.)	0.001 (H.S.)	0.523 (N.S.)	0.001 (H.S.)	0.020 (S.)	0.046 (S.)	0.229 (N.S.)	0.256 (N.S.)	0.099 (N.S.)	0.882 (N.S.)	0.671 (N.S.)	0.950 (N.S.)
Total normal x total excessive	0.327 (N.S.)	0.870 (N.S.)	0.000 (H.S.)	0.301 (N.S.)	0.000 (H.S.)	0.057 (N.S.)	0.001 (N.S.)	0.005 (H.S.)	0.115 (N.S.)	0.022 (S.)	0.769 (N.S.)	0.362 (N.S.)	0.948 (N.S.)

H.S.= Highly significant at P< 0.01
S.= Significant at P> 0.05
N.S.= Not significant at P> 0.05
Number of individual= 80 person