

The Skeletal and Soft Tissue Facial Profile in Adolescent and Adult

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ABSTRACT

Aims: To evaluate the norms for several cephalometric soft tissue measurements and to investigate differences in the mean values of these measurement between two age groups (11–14 and 18–25) and between two gender. **Materials and Methods:** The adolescent sample consists from 30 subjects (15 for each gender) with age range from 11–14 years. The adult sample consists from 30 subjects (15 for each gender) with age range 18–25 years. The two groups satisfying the criteria of balance facial profile, class I molar relation ship and normal over bite–over jet relation ship. Ten skeletal and soft tissue measurements were obtained from tracing lateral cephalometric radiograph. The data was analyzed using descriptive statistic and student t– test. **Results:** During adolescence, no significant differences were found between males and females. During adulthood, the males having higher values for all measurements (except nasolabial and mentolabial angles) but statistically not significant. From adolescent to adult males, the angles of facial convexity, Z– angle in addition to lower lip length and nasal depth are significantly different with the adult male having the higher value. For females, the lower lip length and nasal depth significantly higher in the adult period. **Conclusions:** The adult males having relatively straighter facial profile. In addition, Z– angle also greater in the adult males than during adolescence. For both genders, the nasal depth and the vertical height of lower lip were significantly greater in adults.

Key words: Soft tissue profile, nasolabial angle, mentolabial angle, nasal depth.

Al-Zubaidi SH. The Skeletal and Soft Tissue Facial Profile in Adolescent and Adult. *Al-Rafidain Dent J*. 2009; 9(1): 149–155.

Received: 25/2/2008

Sent to Referees: 25/2/2008

Accepted for Publication: 22/4/2008

INTRODUCTION

The knowledge of growth related changes is essential in planning orthodontic treatment. It is important to understand and anticipate the amount and relative rate of growth in different parts of the face⁽¹⁾, therefore, orthodontists are interested in defining the changes in the various component of the craniofacial structures, including patient's soft tissue profile^(2,3).

Major orthodontic treatment goal is to improve facial esthetic, and the resulting soft tissue profile is one measure of esthetic success⁽⁴⁻⁶⁾.

There have been numerous soft tissue analysis of the face^(7,8), the changes in the soft tissue resulting from growth have

been examined from across-sectional⁽⁹⁾, semi-longitudinal⁽¹⁰⁾, and longitudinal perspective⁽¹¹⁾. Most of these studies agree that a trend for sexual dimorphism is evident regarding the growth of the facial soft tissue. In general, the boys tend to demonstrate increase overall growth when compared with the girls and tend to grow for longer period of time⁽¹²⁾.

Nose height and prominence increase with age with an average annual increase of 2 mm between 5 and 10 years⁽¹³⁾, the nose continues to grow in downward and foreword direction during adulthood⁽¹⁴⁾.

Nanda *et al.*,⁽¹²⁾ reported that growth of the upper lip is completed by 15 years of age in both gender and the average in-

crease in the upper and lower lips height in males was more than two times that of females. Nanda *et al.*,⁽¹²⁾ reported a total increase of soft tissue chin thickness of about 2.7 mm in males and 2mm in females between 7 and 18 years. A similar trend of larger increase in soft tissue chin thickness in males has been reported by Saglam and Gazilerli⁽¹⁵⁾.

The specific objectives of this investigation were to define the norms for several integument variables and to statistically evaluate difference in the mean values of these measurement between two age groups adolescent and adult samples.

MATERIALS AND METHODS

Two groups of untreated subjects were selected. One of them is the adolescent subjects who were selected from some primary and intermediate schools in the center of Mosul City. The sample consisted of 30 subjects (15 for each gender) with age range from 11–14 years. While the other group is the adult subjects who were selected from those attending the College of Dentistry. The adult sample consisted of 30 subjects with age range from 18–25 years. The two groups satisfied the criteria of balanced facial profile, class I molar relation ship, competent lips and normal over bite–over jet relation ship. The data used in this study were derived from lateral cephalograms obtained with the subject's head positioned in a ce-

phalostat and oriented parallel to the Frankfort horizontal plane, the lips in closed position. The radiographs were traced. The skeletal landmarks were determined as described by Thurow⁽¹⁶⁾. The soft tissue landmarks were determined according to the definitions of Chaconas and Bartroff⁽¹⁷⁾.

The angular measurements made are depicted in Figure (1) and included: Angle of skeletal convexity (N–A–Pog)⁽¹⁸⁾, angle of soft tissue facial convexity excluding the nose (N'–Sn–Pog')⁽¹⁸⁾, angle of total facial convexity (N'–Pr–Pog')⁽¹⁸⁾, soft tissue facial plane angle (N'–Pog' to Frankfort horizontal (FH) plane)⁽¹⁹⁾, nasolabial angle (between the tangent to columela of nose and Sn–Ls)⁽²⁰⁾, mentolabial angle (between Li–B' and the tangent to the chin)⁽²¹⁾, Z-angle (Pog'–most protrusive lip to Frankfort horizontal plane)⁽²¹⁾.

All sagittal and vertical linear dimensions were measured perpendicular and parallel to Frankfort horizontal (FH) plane respectively. The linear variables determined were measured by Zylinski *et al.*,⁽²¹⁾ and included: Upper lip length (Sn–St), lower lip length (St–Me'), and nasal depth (Pr–N').

The data were analyzed using descriptive statistics including mean, standard deviation. Student's t– test was used to examine the difference between males and females within the same age group and between the two age groups at $p \leq 0.05$.

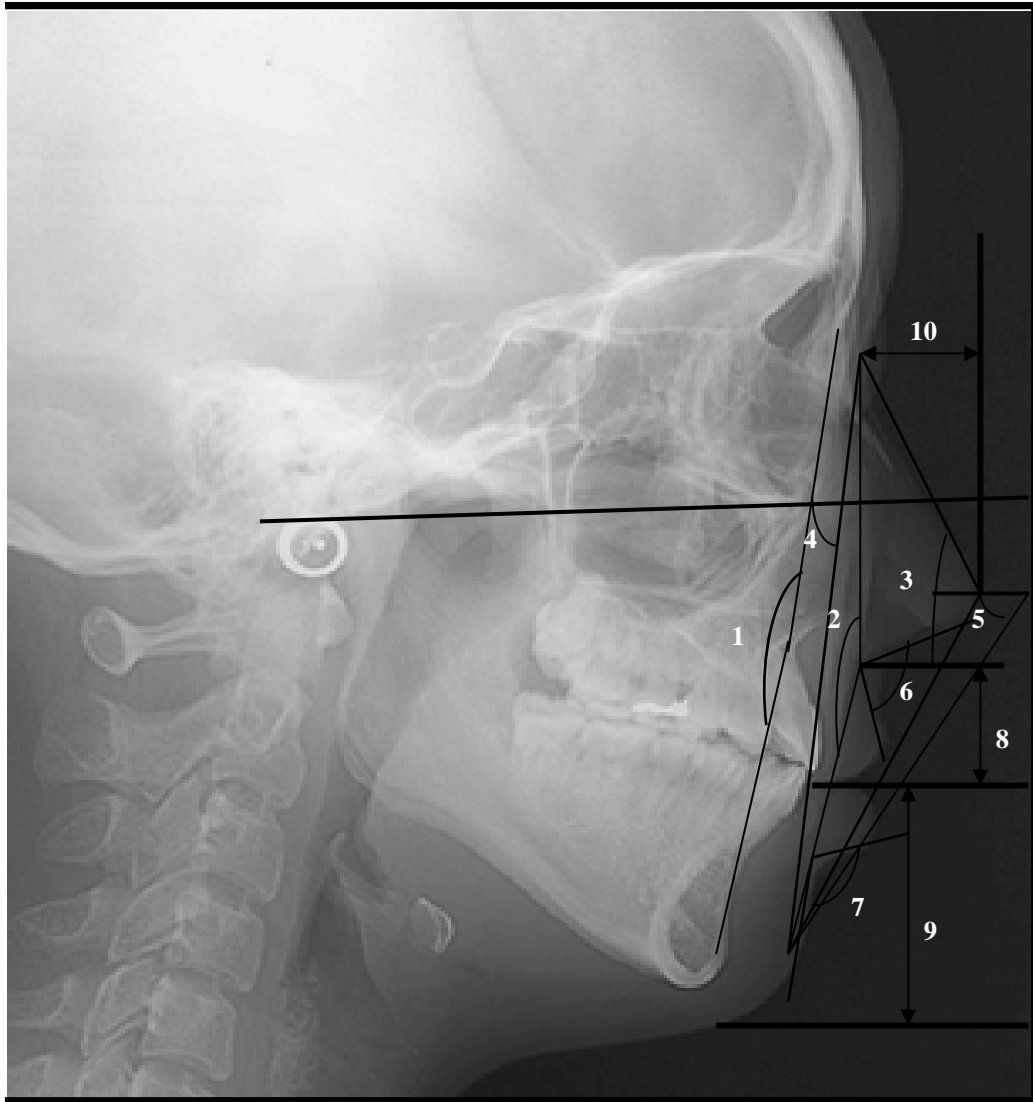


Figure (1): skeletal and soft tissue measurements: 1. N–A–Pog angle, 2. N'–Sn–Pog' angle, 3. N'–Pr–Pog' angle, 4. N'–Pog' to FH angle, 5. Z–angle, 6. nasolabial angle, 7. mentolabial angle, 8. upper lip length, 9. lower lip length, 10. nasal depth.

RESULTS

The descriptive and student t– test analysis of the soft tissue profile for the different age groups are presented in Tables (1, 2, 3 and 4).

1. Comparison between males and females during adolescence

Although the Females having higher values for (N–A–Pog) angle, (N'–Sn–Pog') angle, mentolabial angle, Z– angle and all linear measurements but with no significance.

Males showed higher mean values for (N'–Pr–Pog') angle, (N'–Pog' to FH) angle

and nasolabial angle with no significance as shown in Table (1).

2. Comparison between males and females during adulthood

Males having higher mean values for (N–A–Pog) angle, (N'–Sn–Pog') angle, (N'–Pr–Pog') angle, (N'–Pog' to FH) angle, Z– angle, upper lip length, nasal depth. These values were statistically not significant. While lower lip length was significantly higher in males than in females.

Nasolabial and mentolabial angles were higher in females and statistically not significant as demonstrated in Table (2).

Table (1): mean, standard deviation, and t- value for one skeletal and nine soft tissue variables of adolescent males and females.

	Variables	Sex	Mean	SD	t- value	Sig.
angular	N-A-Pog angle	M	174.53	3.13	-.75	.460
		F	175.86	6.10		NS
	N'-Sn-Pog' angle	M	161.90	2.68	.31-	.755
		F	162.46	6.37		NS
	N'-Pr-Pog' angle	M	131.83	3.46	.62	.537
		F	130.93	4.36		NS
	N'-Pog' to FH angle	M	89.06	3.93	.35	.729
		F	88.63	2.74		NS
	Z- angle	M	72.40	4.57	-.908	.372
		F	74.00	5.06		NS
	Nasolabial angle	M	107.40	6.23	.31	.754
		F	106.53	8.58		NS
Mentolabial angle	M	129.90	11.60	-1.32	.198	
	F	134.63	7.57		NS	
linear	Sn-St	M	20.60	2.38	-.37	.714
		F	20.90	2.04		NS
	St-Me'	M	44.83	2.75	-.85	.401
		F	45.76	2.75		NS
	Nasal depth	M	22.90	6.10	-.57	.572
		F	24.00	4.23		NS

Angular variables are measured in degree, linear variables are measured in mm. SD: standard deviation. Sig: significance, NS: not significant at $p \leq 0.05$.

Table (2): Mean, standard deviation, and t- value for one skeletal and nine soft tissue variables of adult males and females.

	Variables	Sex	Mean	SD	t- value	Sig.
angular	N-A-Pog angle	M	178.70	5.33	2.01	.054
		F	175.13	4.33		
	N'-Sn-Pog' angle	M	166.26	5.40	1.89	.069
		F	162.60	5.20		
	N'-Pr-Pog' angle	M	131.30	4.00	2.04	.051
		F	128.36	3.86		
	N'-Pog' to FH angle	M	91.30	3.74	.28	.776
		F	90.90	3.87		
	Z- angle	M	78.90	5.54	1.11	.275
		F	76.43	6.55		
	Nasolabial angle	M	99.40	14.69	-1.90	.067
		F	109.30	13.74		
Mentolabial angle	M	133.40	11.18	-1.45	.156	
	F	139.20	10.60			
linear	Sn-St	M	21.23	3.33	.37	.714
		F	20.86	1.89		
	St-Me'	M	53.20	3.26	3.41	.002*
		F	48.63	4.02		
	Nasal depth	M	28.73	4.95	.82	.419
		F	27.40	3.88		

Angular variables are measured in degree, linear variables are measured in mm. SD: standard deviation. Sig: significance, * significant at $p \leq 0.05$.

3. Comparison between adolescent and adult males: As illustrated in Table (3), means of the following variables (N-A-Pog) angle, (N'-Sn-Pog') angle, Z- angle,

lower lip length and nasal depth were significantly higher in adult males than those in the adolescent males. While the other variables were statistically not significant.

Table (3): Comparisons of group means between adolescent and adult males.

Variables	Adolescent males	Adult males	t- value	Sig.
N-A-Pog angle	174.53	178.70	-2.61	.016*
N'-Sn-Pog' angle	161.90	166.26	-2.80	.011*
N'-Pr-Pog' angle	131.83	131.30	.39	.699
N'-Pog' to FH angle	89.06	91.30	-1.59	.122
Z- angle	72.40	78.90	-3.50	.002*
Nasolabial angle	107.40	99.40	1.94	.067
Mentolabial angle	129.90	133.40	-.84	.408
Sn-St (mm)	20.60	21.23	-.59	.555
St-Me' (mm)	44.83	53.20	-7.58	.000*
Nasal depth (mm)	22.90	28.73	-2.87	.008*

* significant at P ≤0.05.

4. Comparison between adolescent and adult females:

Adult females having higher mean values for (N'-Sn-Pog') angle, (N'-Pog' to FH) angle, nasolabial angle, mentolabial angle, and Z- angle but statistically not

significant. Meanwhile lower lip length and nasal depth showed statistically significant difference between the two age groups with the adult females having the higher values as demonstrated in Table (4).

Table (4): Comparisons of group means between adolescent and adult females.

Variables	Adolescent females	Adult females	t- value	Sig.
N-A-Pog angle	175.86	175.13	.38	.707
N'-Sn-Pog' angle	162.46	162.60	-.06	.950
N'-Pr-Pog' angle	130.93	128.36	1.70	.099
N'-Pog' to FH angle	88.63	90.90	-1.84	.075
Z- angle	74.00	76.43	-1.13	.265
Nasolabial angle	106.53	109.30	-.66	.514
Mentolabial angle	134.63	139.20	-1.35	.186
Sn-St (mm)	20.90	20.86	.04	.963
St-Me' (mm)	45.76	48.63	-2.15	.040*
Nasal depth (mm)	24.00	27.40	-2.29	.030*

*=significant at P ≤0.05.

DISCUSSION

Previous investigations^(17, 18) have shown that total facial convexity increases with age. This is equated by the angle N'-Pr-Pog' that decreases with age. This increase in total facial convexity has been shown to be due primarily to a greater increase in the nasal prominence relative to the rest of the soft tissue profile with growth. All males and females in this study demonstrated an increase in total

facial convexity with age which comes in agreement with these studies.

Angles of convexity of the facial skeleton and soft tissue excluding the nose tended to be larger in the adult males, indicating relatively straighter facial profile in adult males. This indicates that the skeletal prognathism and soft tissue prognathism of the chin are closely related, rapid increase in skeletal prognathism would serve to bring the soft tissue chin

forward making the soft tissue profile less convex. But, no significant differences between males and females trend with respect to facial convexity were noted. This comes in agreement with the result obtained by Zylinski *et al.*,⁽²¹⁾ and Bishara *et al.*,⁽²²⁾.

Merrifield⁽²³⁾ found that, in the 11 to 15 years age group, the average Z- angle was $78^{\circ} \pm 5^{\circ}$ with females demonstrating higher values than males. In adult, he found the average Z- angle to be $80^{\circ} \pm 5^{\circ}$ with males exhibiting higher values than females. The finding of this study comes in agreement with Merrifield's study.

The upper lip length tends to increase in length as a result of growth until approximately age 14 years and that, after full eruption of the maxillary central incisors, a constant vertical relation ship was maintained to the edge of the incisors. Nanda *et al.*,⁽¹²⁾ reported similar finding with the vertical growth of the upper lip being completed by 15 years for both boys and girls. Graber⁽²⁴⁾ found that the lower lip demonstrated continued growth past age 15 years for girls and through age 18 years for boys. Similar finding also is seen in this study.

Small changes in the upper lip length for males indicate a probability that those with a short lip at 10 years will continue to have a short upper lip even at age 18 years. The impact of this finding on treatment planning is significant because the excessive display of upper gingiva, if present, should be corrected early to establish a more favorable tooth / lip relation ship.

In males, the nasolabial angle decreases with age. This comes in agreement with the result of Abdul-Qadir⁽²⁵⁾. It is difficult to identify the exact cause for the reduction in the nasolabial angle since this angle is formed by two lines, one from the nose and the other from the upper lip and both independent of each other, the measurement of this angle alone does not reveal which component is responsible for the variability. It could be the nose, the lip or both. In females, this angle increased with age which comes in contrast with the finding obtained by Geneccove *et al.*,⁽²⁵⁾.

The mentolabial angle depends on the lower incisor inclinations and the chin

position. Since the females having a more convex facial profile during adolescence and adulthood, indicating a more retruded chin, this may explain the larger mentolabial angle in females than in males in this study.

Nasal depth increases from adolescent to adulthood. This come in agreement with Nanda *et al.*,⁽¹²⁾, they showed that from the age 7 to 16 the median growth curves for males and females run parallel to each other, the size of the nasal depth is approximately similar but the curve being to diverge from age 16 to 18, the male group showed growth acceleration to the females group.

CONCLUSIONS

With increasing age (growth), the adult males were having a relatively straighter facial profile and this fact is represented by greater angles of convexity of facial skeleton, soft tissue excluding the nose and Z- angle. During adulthood, for both gender, a significant increase in nasal depth and lower lip length were noticed.

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