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Facial soft tissue convexity changes.

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ABSTRACT

Aims: To find the soft tissue changes of the total facial convexity, facial convexity and nasolabial convexity among four age groups. **Materials and Methods:** The studying sample subjects included 48, 41, 50 and 44 individuals of age 11, 12, 13 and 14 years respectively. The subjects were Iraqi individuals of class I normal occlusion, who lived in center of Mosul City. All subjects were radiographed with lateral cephalometric films, these films were traced, the tracing included the total facial convexity (Gl–Prn–Pgs angle), facial convexity (Gl–Sn–Pgs angle) and nasolabial convexity (Cm–Sn–Ls angle). **Results:** Displayed that the total facial convexity angle in both sexes appeared that no significant change among the four age groups, the facial convexity appeared insignificant differences among the four age groups in males, while in females showed significant increase between the 14 years age group as compared with 11 years age groups, and the nasolabial convexity demonstrated no significant changes among the four age groups for males, whereas in females showed no significant di-fference between 11 and 12 years age group and between 13 and 14 years groups, meanwhile, the 13 and 14 years age group explained significant decrease as compared with 11 and 12 years age groups. The sex variation showed the only significant increase in females than males at 11 years age group for the nasolabial angle. Whereas no significant change between males and females in all the angles at the 12 and 13 years age group. In 14 years age group, the facial convexity angle only showed a significant increase in females as compared with males. **Conclusion:** No significant change in total facial convexity, facial convexity and nasolabial convexity angles among the four age groups in males. Whereas, in females there were a significant increase at 14 years age group, than 11 years age groups for facial convexity and nasolabial convexity angles.

Key words: Total facial convexity, Facial convexity, Nasolabial convexity.

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INTRODUCTION

The facial soft tissues were considered as dynamic structures, that can develop along with or independent of their skeletal substructure, their variation in thickness, length and tonicity may have an effect on the position and relationship of facial structures.[1]

The facial skeleton is the structure of the overlying soft tissues and their relative prportion that provide the visual impact of the face.[2]

The midface soft tissue form and position appear to be less dependent on underlying hard tissue than for lower facial soft tissues.[3]

Nanda [4], reported that: it is important to understand and anticipated the amount and relative rate of growth in different part of the face. Soft tissue values are important as hard tissue values.[5]

Authers demonstrated that the soft tissue facial convexity tend to decrease by increasing the age.[6,7] Others displayed that there was very little difference between extraction and non extraction orthodontic treatment on soft tissue profile.[3, 8]

The aims of this study were to evaluate the value of change of the facial soft tissue convexity angles among the ages of 11 to 14 years of Iraqi subjects who lived in Mosul City.

MATERIALS AND METHOD

The sample was selected from 20 intermediate schools (11 for girls and 9 for boys) and 16 primary schools (8 for girls and 8 for boys) in the center of Mosul City.

The criteria for the sample selected were: Full complement of permanent teeth excluding the third molars, normal occlusion class I molar and canine relationship[7,9], normal overjet and overbite (1–4mm)[10], no detectable crowding and rotation and spacing[7,11], no apparent facial disharmony, no previous orthodontic treatment or maxillofacial surgery.

The sample met the criteria was divided according to age into four groups: 11 years age group (23 males and 25 females); 12 years age group (19 males and 22 females); 13 years age group (22 males and 28 females); 14 years age group (22 males and 22 females).

Each subject was radiographed with lateral cephalometric film in the Radiology Center in the Dental School, University of Mosul, with standardized manner for all the individuals according to Radiology Center instructions.

The lateral cephalometric radiograph films were traced, the tracing included the facial soft tissue convexity parameters which were: the angle of total facial convexity (Gl–Prn–Pgs) as suggested by Bishara *et al.*[12], angle of facial convexity (Gl–Sn–Pgs) as designed by Burston[13], and angle of nasolabial convexity (Cm–Sn–Ls) as utilized by Nanda *et al.*[10] (Figure 1).

The results were analyzed by applying the descriptive analysis that include: mean, stndard deviation, minimum and maximum vaues, analysis of variance ANOVA and Duncan's multiple range test at $p \leq 0.05$, to detect the changes of the soft tissue facial convexity angles, and student T–test at $p \leq 0.05$ to find the sex variation.

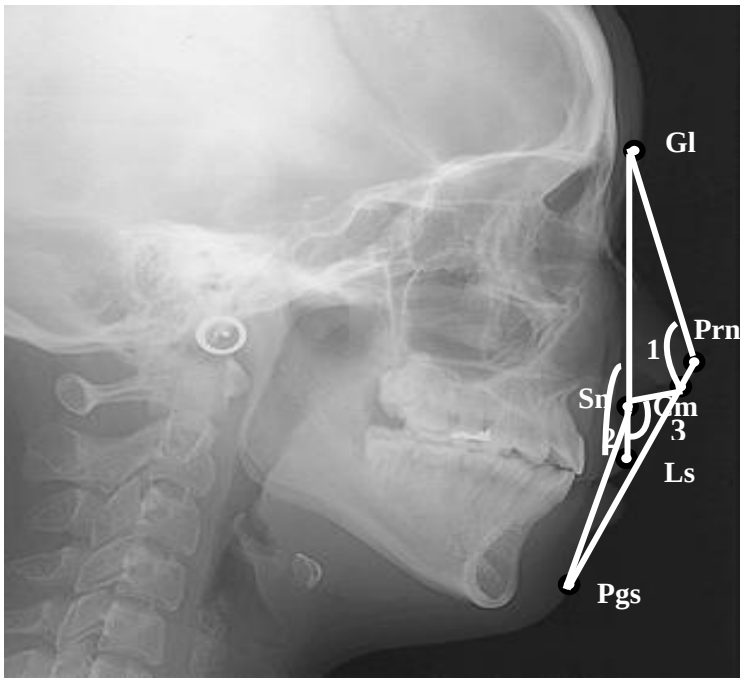

Figure (1): Soft tissue angular measurements. 1. Angle of total facial convexity(Gl–Prn–Pgs); 2. Angle of facial convexity (Gl–Sn–Pgs); 3. Nasolabial angle (Cm–Sn–Ls)

RESULTS

The descriptive analysis of the soft tissue facial convexity angles (Table 1) showed, in males, that the (Gl – Sn – Pgs) angle appeared the highest mean value at 13 years group, while the (Cm – Sn – Ls) angle showed the highest mean value at 12 years groups and the (Gl – Prn – Pgs) angle displayed the greatest mean value at 11 years. In females, the (Gl – Sn – Pgs) angle appeared the largest mean value at 14 years whereas the (Gl – Prn – Pgs) and the (Gl – Sn – Pgs) angles demonstrated the biggest mean value at 11 years.

The comparison of the soft tissue convexity angles displayed, in males, that the dif-

ference between 11 years and 12 years groups revealed higher value at 12 years group with no significance for (Cm – Sn – Ls) angle, whereas, the (Gl – Prn – Pgs) and the (Gl – Sn – Pgs) angles displayed insignificant smaller values at 12 years group. The comparison between 13 years and 14 years groups demonstrated that the (Gl – Prn – Pgs), (Gl – Sn – Pgs) and (Cm – Sn – Ls) angles smaller values at 14 years group with no significant level. In female sample, the comparing 11 years and 12 years groups, the (Gl – Sn – Pgs) angle demonstrated higher value at 11 years group and the (Gl – Prn – Pgs) and (Cm – Sn – Ls) angles showed smaller value at 12 years age group than 11 years group. All these differences failed to reach the significant level. While in comparison between 12 years and 13 years groups revealed higher value at 13 years group with no significance for (Gl – Prn – Pgs) and (Gl – Sn – Pgs), whereas, (Cm – Sn – Ls) angle showed significantly smaller at 13 years group than 12 years group and in comparing 13 years and 14 years groups the (Gl –Sn– Pgs) angle displayed insignificantly higher value at 14 years, whereas the (Gl – Prn – Pgs) and (Cm – Sn – Ls) angles appeared insignificantly smaller values at 14 years group. The comparison between 11 years and 14 years groups showed insignificantly higher values at 14 years group for the (Gl – Prn – Pgs) angle, whereas the (Cm – Sn – Ls) angle displayed significantly smaller value at 14 years group than 11 years group. The only significant difference noticed between 14 years group and 12 years group was for (Cm – Sn – Ls) angle which showed higher value at 12 years group (Tables 2, 3 and 4 and figures 2 and 3).

Table (1): Descriptive statistics for the soft tissue variables of males and females of four age groups.

Age group	Variable	Examination	Number	Minimum	Maximum	Mean ±SD
11 years	Gl–Prn–Pgs	Male	23	130	148	139.87± 4.61
		Female	25	132	147	138.90± 3.09
	Gl–Sn–Pgs	Male	23	151	170	163.15± 4.60
		Female	25	154	170	161.46± 3.89
	Cm–Sn–Ls	Male	23	99	119	108.70± 6.04
		Female	25	105	126	113.14± 4.74
12 years	Gl–Prn–Pgs	Male	19	130	145	139.18± 3.86
		Female	22	129	147	137.91± 4.48
	Gl–Sn–Pgs	Male	19	155	170	163.08± 2.95
		Female	22	152	173	162.61± 5.59
	Cm–Sn–Ls	Male	19	97.5	123	110.29± 7.83
		Female	22	98	125	111.91± 7.69
13 years	Gl–Prn–Pgs	Male	22	130	145	138.39± 4.08
		Female	28	131	144.5	138.20± 3.91
	Gl–Sn–Pgs	Male	22	156	169	163.32± 4.09
		Female	28	156.5	172	164.59± 4.25
	Cm–Sn–Ls	Male	22	91.5	121	107.50± 6.98
		Female	28	90	117.5	105.12± 6.71
14 years	Gl–Prn–Pgs	Male	22	126	145	137.07± 4.16
		Female	22	128.5	144	136.77± 3.41
	Gl–Sn–Pgs	Male	22	153.5	168	162.27± 3.92
		Female	22	157	179	166.11± 5.02
	Cm–Sn–Ls	Male	22	97	116	106.70± 4.77
		Female	22	85	118.5	102.48± 9.50

All measurements in degree; Gl–Prn–Pgs: Angle of total facial convexity; Gl–Sn–Pgs: Angle of facial convexity; Cm–Sn–Ls: Nasolabial angle.

Table (2): Analysis of variance and Duncan's Multiple Range Test of Gl–Prn–Pgs variable for the four age groups

Age Group	Number	Mean ± SD	Duncan's Grouping*
		Male	
11 Years	23	139.870± 4.610	A
12 Years	19	139.180± 3.860	A
13 Years	22	138.390± 4.080	A
14 Years	22	137.070± 4.160	A
		Female	
11 Years	25	138.900± 3.090	A
12 Years	22	137.910± 4.480	A
13 Years	28	138.200± 3.910	A
14 Years	22	136.770± 3.410	A

* Means with the same letters were statistically not significant; SD: Standard deviation.

Table (3): Analysis of variance and Duncan's Multiple Range Test of Gl–Sn–Pgs variable for the four age groups

Age Group	Number	Mean ± SD	Duncan's Grouping*
		Male	
11 Years	23	163.150± 4.600	A
12 Years	19	163.080± 2.950	A
13 Years	22	163.320± 4.090	A
14 Years	22	162.270± 3.920	A
		Female	
11 Years	25	161.460± 2.890	A
12 Years	22	162.610± 5.590	AB
13 Years	28	164.590± 4.250	AB
14 Years	22	166.110± 5.020	B

* Means with the same letters were statistically not significant; SD: Standard deviation

Table (4): Analysis of variance and Duncan's Multiple Range Test of Cm–Sn–Ls variable for the four age groups

Age Group	Number	Mean ± Sd	Duncan's Grouping*
		Male	
11 Years	23	108.700± 6.040	A
12 Years	19	110.290± 7.830	A
13 Years	22	107.500± 6.980	A
14 Years	22	106.700± 4.770	A
		Female	
11 Years	25	113.140± 4.740	A
12 Years	22	111.910± 7.690	A
13 Years	28	105.120± 6.710	B
14 Years	22	102.480± 9.500	B

* Means with the same letters were statistically not significant; SD: Standard deviation

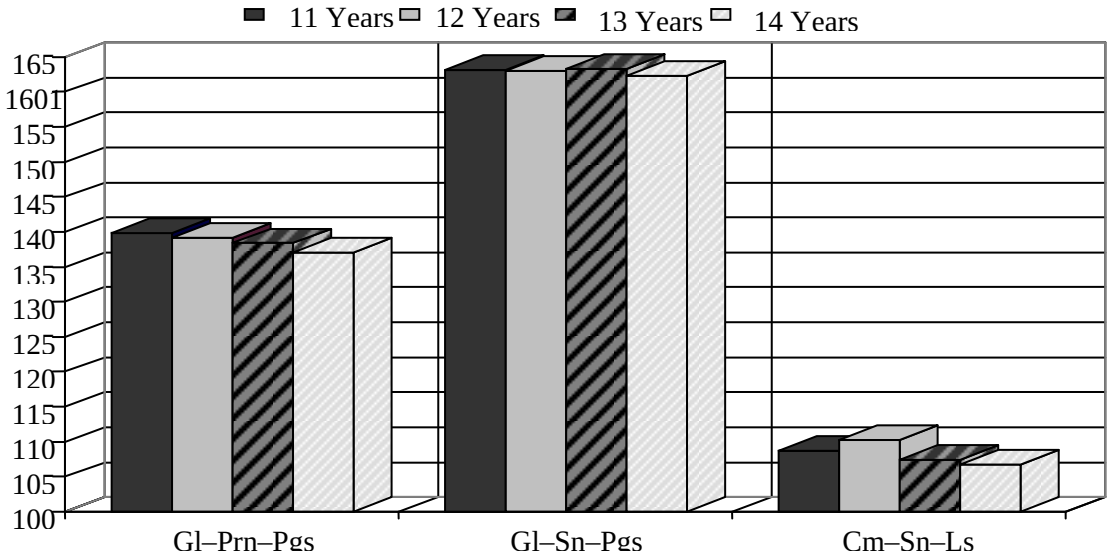

Figure (2): Means for the soft tissue angular parameters of males for the four age groups

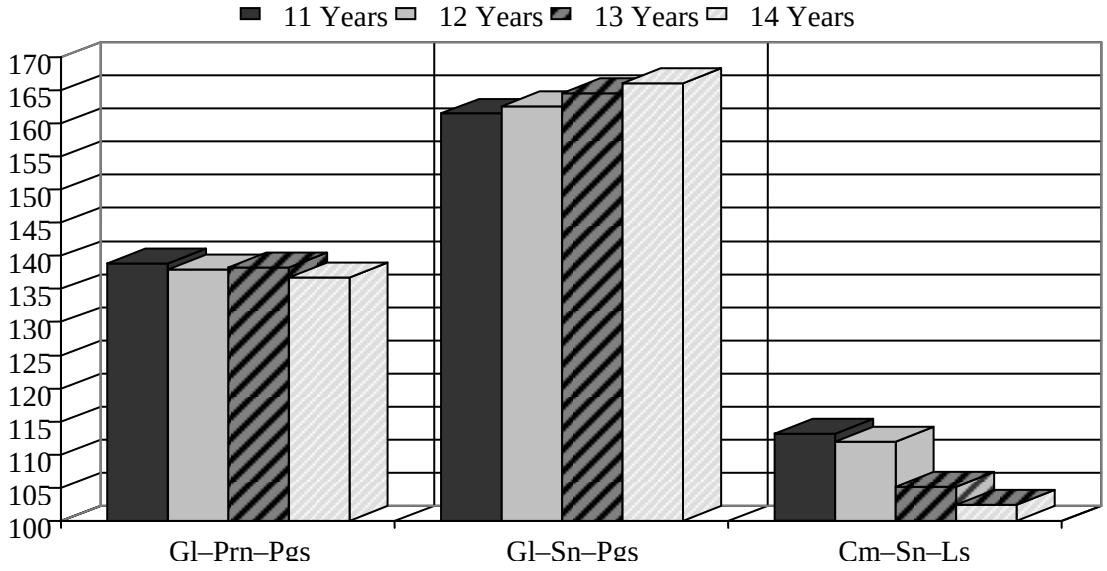

Figure (3): Means for the soft tissue angular parameters of females for the four age groups

The comparison of soft tissue convexity angles between sexes explored that, at 11 years group males displayed higher value than females with no significant difference for (Gl – Prn – Pgs) and (Gl – Sn – Pgs) angles. Females demonstrated significantly higher value than males for (Cm – Sn – Ls) angle. At 12 years group, males demonstrated insignificantly higher values than females for (Gl – Prn – Pgs) and (Gl – Sn – Pgs) angles. Females displayed higher values with no significance for (Cm – Sn – Ls) angle than males. Whereas, at 13 years group revealed higher value in males but without significance for; (Gl – Prn – Pgs) and (Cm – Sn – Ls) angles than females. Females displayed higher values with no significance for (Gl – Sn – Pgs) angle than males, meanwhile, at 14 yea-

rs group, male demonstrated greater value with no significance for (Gl – Prn – Pgs) and (Cm – Sn – Ls) angles than females. While females appeared bigger value with significance for (Gl – Sn – Pgs) angle than males (Table 5).

Table (5): Student's t–test for the soft tissue variables between males and females for the four age groups

Age group	Variable	Examination	No.	Mean± SD	df	t–test	*P*–value
11 years	Gl–Prn–Pgs	Male	23	139.87±4.61	46	0.86	0.39
		Female	25	138.90±3.09			
	Gl–Sn–Pgs	Male	23	163.15±4.60		1.38	0.17
		Female	25	161.46±3.89			
	Cm–Sn–Ls	Male	23	108.70±6.04		–2.85	0.0066+
		Female	25	113.14±4.74			
12 years	Gl–Prn–Pgs	Male	19	139.18±3.86	39	0.97	0.34
		Female	22	137.91±4.48			
	Gl–Sn–Pgs	Male	19	163.08± 2.95		0.33	0.75
		Female	22	162.61±5.59			
	Cm–Sn–Ls	Male	19	110.29±7.83		–0.67	0.51
		Female	22	111.91±7.69			
13 years	Gl–Prn–Pgs	Male	22	138.39±4.08	48	0.17	0.87
		Female	28	138.20±3.91			
	Gl–Sn–Pgs	Male	22	163.32±4.09		–1.07	0.29
		Female	28	164.59±4.25			
	Cm–Sn–Ls	Male	22	107.50±6.98		1.22	0.23
		Female	28	105.12±6.71			
14 years	Gl–Prn–Pgs	Male	22	137.07±4.16	42	0.26	0.80
		Female	22	136.77±3.41			
	Gl–Sn–Pgs	Male	22	162.27±3.92		–2.83	0.0071+
		Female	22	166.11±5.02			
	Cm–Sn–Ls	Male	22	106.70±4.77		1.87	0.069
		Female	22	102.48±9.50			

Measurements in degrees; SD: Standard deviation; df: Degree of freedom; Gl–Prn–Pgs: Angle of total facial convexity; Gl–Sn–Pgs: Angle of facial convexity; Cm–Sn–Ls: Nasolabial angle

+ Significant differences between males and females ($p \leq 0.05$).

DISCUSSION

In males, the angle of total soft tissue convexity (Gl–Prn–Pgs) showed smaller values with increasing age group with no significancies. This finding can be explained by increasing in total soft tissue convexity of facial profile with age. Similar findings were reported by authors[14, 15], who showed a decreased total soft tissue convexity angle from 11 to 14 years in males. Bishara *et al.*[7] also reported a decrease in this angle between 10 and 15 years in males.

In females, this angle showed no significant difference among the four age groups with smaller value noticed at 12 years group than that at 11 years group. At 13 years group it showed a higher value than that at 12 years group, but it still lower than the value at 11 years group. At 14 years group, this angle showed smaller value than those for the other three groups. Generally, it can be concluded that this angle decreased with increasing age group. This comes in agreement with the findings of researches[14, 15], who demonstrated a decreased total soft tissue convexity angle in females from 11 to 14 years. Similar findings were also reported by Bishara *et al.*[7] for female subjects between 10 and 15 years.

The increase in total facial convexity with age can be explained by the greater increase in nasal prominence relative to the rest of the soft tissue profile with growth as stated by Subtelny.[14]

The comparison between males and females revealed that males possessed higher values for (Gl–Prn–Pgs) angle than females in the four age groups but without significance. This may indicate that males have less convex soft tissue facial profile than females. This was consistent with the findings of Bishara *et al.* [15] who showed a more convex profile in females than males from 8 to 14 years.

For males, the angle of soft tissue convexity (Gl–Sn–Pgs) showed smaller value at 12 years group than that at 11 years group. At 13 years group, the value was higher than those at 11 and 12 years group, while at 14 years group it showed smaller value than the other three groups. No significant difference was noticed among the four age groups. It can be noticed that there was fluctuation in this angle with increasing age group. Similar findings were reported by Subtelny[14], who demonstrated fluctuations in this angular measurement from 6 to 18 years of age and he stated that this fluctuation indicate minimal changes in this angle and reflect the relative stability of the angle of soft tissue profile convexity exclusive of the nose.

The (Gl–Sn–Pgs) angle showed higher values with increasing age groups in females with significance noticed between 11 and 14 years groups. This indicated a decrease in soft tissue profile convexity with age. These findings coincide with those authors[15, 16] who reported an increased soft tissue convexity angle in females from 11 to 14 years. Bishara *et al.* [7], reported similar findings for female subjects between 10 and 15 years. On the other hand, the findings of this study disagree with those reported by Pelton and Elsasser[17], who demonstrated that this angle in females tend to decrease from childhood to adulthood making the soft tissue profile more convex.

Comparison between males and females revealed higher values for males than females at 11 years and 12 years groups with no significance. Females showed higher values than males at 13 years and 14 years groups with significance noticed at 14 years group only. This indicates a straighter profile in females at 13 years and 14 years groups, which may be attributed to the larger amount of mandibular prognathism that was noticed in females, and as stated by Subtelny[14] 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.

The Nasolabial convexity Angle (Cm–Sn–Ls) in males showed higher value at 12 years group than 11 years group. At 13 years group it showed smaller value than those at 11 and 12 years groups. At 14 years group the value of this angle was smaller than the values at the other three groups. No significant difference was noticed among the four groups. Generally, it can be concluded that this angle decreased with increasing age group. This comes in agreement with Genecove *et al.*[18] who reported a decrease in this angle between 12 and 17 years in males and with Prahl–Andersen *et al.* [6] who showed that nasolabial angle decreased from 9 to 14 years in males.

In females, this angle demonstrated smaller values with increasing age group and significant difference was noticed between both 11 years, 12 years groups and the other two groups. These findings are consistent with the researchers[6, 18], who demonstrated a decrease in nasolabial angle in females between 12 and 17 years and from 9 to 14 years, respectively.

It is difficult to identify the exact cause for the reduction in the nasolabial angle and this was explained by Fitzgerald *et al.*[19] who showed that 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.

Comparison between males and females showed higher values in females than in males at 11 years and 12 years groups with significance noticed at 11 years groups. Males showed higher value than females at 13 years and 14 years groups but with no significance. Prahl–Andersen *et al.*[6] reported a larger nasolabial angle in females than in males from 9 to 14 years.

CONCLUSION

The soft tissue angular measurements demonstrated a significant difference among the four age groups in female subjects only, where they showed a significantly hi-gher value at 14 years group than 11 years group for (Gl–Sn–Pgs) angle indicating a decrease in soft tissue facial convexity with increasing age. Females also demonstrated a significantly smaller value for (Cm–Sn–Ls) angle at 14 years group as compared to 11 years group.

Females showed a significantly higher value for angle of soft tissue convexity excluding the nose (Gl–Sn–Pgs) at 14 years group indicating a straighter soft tissue profile in females.

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