ORIGINAL ARTICLE

Soft Tissue Photographic Analysis of the Soft Tissue Profile in a Pakistani Population Sample

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ABSTRACT

Aim: To determine the soft tissue linear and angular measurements of skeletal class-I patients and gender dimorphism from the selected sample.

Methods: This descriptive study was carried out at Orthodontics Department, de' Montmorency College of Dentistry/ Punjab Dental Hospital, Lahore between 2006 to 2007. The sample comprised of subjects within age 16 through 20 years. All subjects had Class I dental and skeletal relationships, competent lips with normal over-jet and over-bite. Lateral photographs of all the subjects were taken at natural head position. A total 22 parameters were evaluated which included 8 linear measurements four Canut's linear measurements six linear horizontal measurements four angular measurements.

Results: In the study of facial heights [Superior Facial Third (Tri-G), Middle Facial Third (G-Sn), Inferior Facial Third (Sn-Me)], the similarity between the inferior facial third (Sn-Me: males 40.5±0.123 mm and females 39.9±0.09 mm) and the middle facial third was observed. However, in the superior third (Tri-G: males 40.5±3.6 mm and females 39.9±3.1 mm), sexual dimorphism was not found nor were the facial thirds proportional with the other thirds.

Conclusion: Concluded, that profile depends on age, gender and ethnic group of that individual.

Keywords: Orthodontics, Soft tissue, Occlusion, Lateral photograph

INTRODUCTION

Facial esthetic has been a subject of interest to people of all cultures[1]. World is full of evidence of what human beings have done since antiquity to make them selves more beautiful and attractive[2]. One of the major goals for the orthodontist is to achieve a good functional occlusion and facial esthetics[3] that is being emphasized now a days[4]. Successful orthodontic treatment involves diagnosis and planning to achieve the addressed goals[5]. The facial skeleton and its soft tissue drape determine facial harmony and balance[6]. The orthodontic treatment influences facial esthetics to a significant extent. It is indispensable in clinical practice, where it is employed to aid in treatment planning with particular reference to soft tissue changes after orthodontic treatment[7].

Different researchers have developed characteristics of the three known classes of malocclusion, naming class I, class II and class III, among various populations. These analysis are used for the diagnosis and planning the treatment so as to improve the function and esthetics of the individuals and to attain facial harmony. Investigators have developed numerous methods of analyses to interpret the diagnostic information that the lateral even a single variable regarding the soft tissue photograph provides[2-7]. The issue of soft tissue profiles, however, played a small part in the majority profile, and substantial studies on this issue were lacking[2,8]. Soft tissue analysis is an important prerequisite for the esthetic outcome of the orthodontic treatment.

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MATERIALS AND METHODS

This descriptive study was carried out at Orthodontics Department, de' Montmorency College of Dentistry/Punjab Dental Hospital, Lahore between 2006 to 2007. The sample comprised of subjects within age 16-20 years, class I dental and skeletal relationships, competent lips with normal over-jet and over-bite were included. Patients who have history of previous orthodontic treatment, craniofacial disorders, thumb sucking and facial/dental trauma was excluded from the study. Lateral photographs of all the subjects were taken at natural head position. A total 22 parameters were evaluated which included eight linear measurements four Canut's linear measurements six linear horizontal measurements four angular measurements. The lateral facial photograph will be taken under standardized condition by the same operator at natural head position of the patient. Each subject stood on a line on the floor, framed by a vertical scale divided in 5-cm segments. The soft tissue landmarks were used superior facial third (Tri-G), middle facial third (G-Sn) and inferior facial third (Sn-Me). Data was analysed through computer software SPSS-10. Student 't' test was used for comparing males and females and tracing I and tracing II parameters.

RESULTS

In the study of facial heights (Tri-G, G-Sn, Sn-Me, the similarity between the inferior facial third (Sn-Me: males 40.5±0.123 mm and females 39.9±0.09 mm) and the middle facial third was observed. However, in the superior third (Tri-G:males 40.5±3.6 mm and females 39.9±3.1 mm), sexual dimorphism was not found nor were the facial thirds proportional with the other thirds. On analyzing the nose, it was observed that males had greater length (N-Sn: males 32.2±2.9 mm and females 33.4±4.3 mm) and nasal prominence (Prn/Sn-Sm: males 15.4±2.3 mm and females 15.2±2.2mm; Prn to N-Ort line: males 15.3±2.6 mm and females 15.2±2.7 mm: al-Prn: males 18.9±2.2 mm and females 17.7±2.4 mm) than females, with statistically significant differences. The height of the nasal tip (Sn-Prn: males 6.8±1.6mm and females 7.0±2.2mm) was the only nasal measurement that did not show sexual dimorphism. On analyzing the labial prominence with regard to the Sn-Sm line, it was observed that both the upper lip (Ls/Sn-Sm: males 9.2±2.0mm and females 8.1±3.3mm) and the lower lip (Li/Sn-Sm: males 7.9±2.0mm and females 6.8±2.3mm), the difference between gender dimorphism was not significant.

Regarding the N-Ort-line, however, both the upper lip (Ls-N-Ort-line: males 8.9±2.4 mm and females 7.6±2.8mm) and the lower lip (Li-N-Ort-line: males 7.6±2.8mm and females 6.1±2.9mm) showed a different prominence, which was significantly more evident in males. In both cases, the upper lip was more forward than the lower one. The different prominence of the lips with regard to the reference lines could possibly be explained by the different NHP in males and females.

The height of the chin (Sm-Me), analyzed by Park and Burstone[9] measured 30 to 35 mm with no sexual differences. In this study, all measurements of the analysis in the area of the chin showed sexual dimorphism characterized by greater length (Sm-Me: males 16.7±2.7 mm and females 16.2±3.4 mm) and greater prominence (P<0.01) in females than in males (Pg-N-Ort-line: males 0.4±1.1 mm and females 0.6±0.3mm; Pg/Sn-Sm: 0.5±0.1 mm and females 1.7±0.4 mm).

In present study, sexual dimorphism was found for several angles: nasolabial and submentolabial: P<0.01), and mandibular contour (chin throat angle: P<0.01). Less individual variations in nasolabial (male: 99.95±9.49, Female: 105±11.58) and submentolabial (male: 105.21±10.57, female: 102.90±14.02) angles were observed. Slight difference in gender was observed in chin throat angle (male: 100.83±9.55, female 99.71±1.15).

Table 1: Comparison of linear vertical measurements for method error of male and female patients

Photographic parameters	Male patients		P value	Female patients		P value
	Tracing I	Tracing II		Tracing I	Tracing II	
Tri-G	40.5.2±3.6	40.5±3.7	0.123	39.9±3.1	40.1±4.1	0.090
G-Sn	42.5±3.5	42.9±3.7	0.334	43.6±3.6	42.1±3.6	0.791
Sn-Me	41.9±3.6	42.4±3.7	0.251	42.4±3.3	42.0±3.8	0.562
N-Sn	32.2±2.9	33.7±3.2	0.057	33.4±4.3	32.2±3.4	0.731
Sn-Sts	16.8±1.6	15.6±1.3	0.052	16.0±2.3	16.2±1.6	0.032
Sti-Sm	15.7±2.3	14.8±1.0	1.00	14.7±2.4	15.2±1.7	0.029
Sm-Me	16.7±2.7	17.3±3.0	0.93	16.2±3.4	17.7±2.4	0.005
Sn-Prn	6.8±1.6	6.8±1.6	0.287	7.0±2.2	6.9±1.4	0.013

Table 2: Comparison of Canut's linear vertical measurements for method error of male and female patients

Photographic parameters	Male patients		P value	Female patients		P value
	Tracing I	Tracing II		Tracing I	Tracing II	
Prn to Sn-Sm	15.4±2.3	16.2±2.1	0.181	15.2±2.2	16.0±1.5	0.002
Ls to Sn-Sm	9.2±2.0	8.5±2.2	0.843	8.1±3.3	8.8±2.2	0.019
Li to Sn-Sm	7.9±2.0	7.4±1.7	0.806	6.8±2.3	7.7±1.9	0.00
Pg to Sn-Sm	0.5±1.8	1.6±1.2	0.00	1.7±0.4	0.9±0.1	1.00

Table 3: Comparison of linear horizontal measurements for method error of male and female patients

Photographic parameters	Male patients		P value	Female patients		P value
	Tracing I	Tracing II		Tracing I	Tracing II	
Trg-Sn	77.5±7.2	76.4±7.1	0.713	72.3±7.7	73.6±7.5	0.071
Al-Prn	18.9±2.2	19.0±2.0	0.666	17.7±2.4	19.1±2.4	0.001
Prn to N-Ort line	15.3±2.6	15.5±2.3	0.688	15.2±2.7	16.1±2.0	0.005
Ls to N-Ort line	8.9±2.4	7.6±2.3	0.313	7.6±2.8	8.5±2.6	0.010
Li to Ort line	7.6±2.8	6.3±2.5	0.542	6.1±2.9	7.1±2.8	0.030
Pg to N-Ort line	0.04±1.1	1.7±1.6	0.00	0.6±3.0	0.8±1.4	0.113

Table 4: Comparison of angular measurements for method error of male and female patients

Photographic parameters	Male patients		P value	Female patients		P value
	Tracing I	Tracing II		Tracing I	Tracing II	
Nasolabial angle	99.95±9.49	103.48±10.67	0.463	105.6±11.58	97.44±6.86	0.077
Submentolabial angle	105.21±10.57	107.68±10.94	0.026	102.90±14.02	99.08±12.51	0.173
Chin Throat angle	100.83±9.55	101.36±11.99	0.368	99.71±1.15	98.24±8.47	0.378
Chin Neck Throat angle	110.59±7.28	112.80±7.41	0.002	120.14±10.50	120.68±6.49	0.465

DISCUSSION

In the study of facial heights (Tri-G, G-Sn, Sn-Me, the similarity between the inferior facial third (Sn-Me: males 40.5±0.123 mm and females 39.9±0.09 mm) and the middle facial third was observed, as Powell and Humphreys[10] pointed out. Epker[11] however, found that the middle third was slightly larger (38%) than the inferior third (32%). In both cases: males showed more similarity between the facial thirds and significantly larger absolute values than did females; this coincides with the findings of other authors[12,13]. However, in the superior third (Tri-G:males 40.5±3.6 mm and females 39.9±3.1mm), sexual dimorphism was not found nor were the facial thirds proportional with the other thirds. Farkas[14] published sexual differences (males 58±6mm and females 51±6mm) in which the heights were also larger in males. Facial depth (Trg-Sn) was also shown to be significantly larger in males (77.5±7.2mm) than in females (72.3±7.7 mm). Nanda and Ghosh[15] studied the facial depth in nasal tip (Trg-Prn), observing significant sexual differences (males 122±4 mm and females 113±5 mm). On the other hand, the great individual variability, with high standard deviations (SDs), and the difficulty of measuring the Trg and the Tri points should be mentioned. This was reflected in the high method error at the facial superior height and the facial depth.

On analyzing the nose, it was observed that males had greater length (N-Sn: males 32.2±2.9 mm and females 33.4±4.3 mm) and nasal prominence (Prn/Sn-Sm: males 15.4±2.3 mm and females 15.2±2.2mm; Prn to N-Ort line: males 15.3±2.6 mm and females 15.2±2.7 mm: al-Prn: males 18.9±2.2 mm and females 17.7±2.4 mm) than females, with statistically significant differences. The height of the nasal tip (Sn-Prn: males 6.8±1.6 mm and females 7.0±2.2 mm) was the only nasal measurement that did not show sexual dimorphism. This finding coincides with those of Nanda and Ghosh.[15] With regard to the reliability of the parameters, we can say that, in most measurements, variability was not excessive (SD=2-4mm), as was the case with the error, which ranged from 1 to 1.5mm.

On analyzing the labial prominence with regard to the Sn-Sm line, it was observed that both the upper lip (Ls/Sn-Sm: males 9.2±2.0 mm and females 8.1±3.3 mm) and the lower lip (Li/Sn-Sm: males 7.9±2.0 mm and females 6.8±2.3 mm), the difference between gender dimorphism was not significant.

Regarding the N-Ort-line, however, both the upper lip (Ls-N-Ort-line: males 8.9±2.4 mm and females 7.6±2.8 mm) and the lower lip (Li-N-Ort-line: males 7.6±2.8 mm and females 6.1±2.9 mm) showed a different prominence, which was significantly more evident in males. In both cases, the upper lip was more forward than the lower one. The different prominence of the lips with regard to the reference lines could possibly be explained by the different NHP in males and females.

The height of the chin (Sm-Me), analyzed by Park and Burstone[16] measured 30 to 35 mm with no sexual differences. In this study, all measurements of the analysis in the area of the chin showed sexual dimorphism characterized by greater length (Sm-Me: males 16.7±2.7 mm and females 16.2±3.4 mm) and greater prominence (P<0.01) in females than in males (Pg-N-Ort-line: males 0.4±1.1 mm and females 0.6±0.3mm; Pg/Sn-Sm: 0.5±0.1 mm and females 1.7±0.4 mm). In present study, sexual dimorphism was found for several angles: nasolabial and submentolabial: P<0.01), and mandibular contour (chin throat angle P<0.01). Less individual variations in nasolabial (male: 99.95±9.49, Female: 105±11.58) and submentolabial (male: 105.21±10.57, female: 102.90±14.02) angles were observed. Slight difference in gender was observed in chin throat angle (male: 100.83±9.55, female 99.71±1.15). Sexual dimorphism was found for several angles: nasofrontal (G-N-Prn: P<0.01), vertical nasal (Cm-Sn/N-Prn: P<0.01), nasal (N-Prn/TV: P<0.01), nasal dorsum (N-Mn-Prn: P<0.05), and mandibular contour (C-Me/G-Pg: P<0.01). Wide individual variations in nasolabial and mentolabial angles were also observed[17].

No significant different was found in the form of lower lip, soft tissue facial angle and Z angle. Nasolabial angle only reflected change of upper lip, but could not reflect characters of facial profile.[18] There is no absolutely ideal nasolabial angle. In general though, the nasolabial angle to be greater than 90 degrees for anyone. The nasolabial and the mentolabial angles did not differ significantly between the younger and the older age groups.[19] The submental-cervical angle (Sm-Ce) and the submental soft tissue thickness at C point (IBM-Sm) presented the greatest disparity between the ideal subjects (118.0 degrees, 28.0 mm), P<0.001).[20] In Chin neck throat angle (male 110.59±7.28, female 120.14±10.50), wide difference show in gender, more

in females than males. The values of tracing I and tracing II shows no noticeable difference among all the parameters except in upper facial height as there were difficulty in locating the tri-chon point and in the facial depth as the tragous point was the difficult. However, the height of the lower lip also shown some difference. Tracing I and tracing II, showed some difference by measuring chin neck throat angle.

CONCLUSION

The labial, nasal, and chin areas showed sexual dimorphism in most of the parameters we used. Males have larger faces in general, with greater facial heights; longer nasal, labial, and chin lengths, prominence and a greater nasal and facial depth. A proportion of 1:1 between the middle and the inferior facial thirds was observed. There is no markable difference in all parameters, between Tracing I and tracing II. A great variability and a greater sexual dimorphism in the relative measurements to the N-Ort-line were observed. The differences were very marked in the prominence of the lower lip and the chin. The errors were found in facial superior height and facial depth, mainly due to the difficulty in the localization of trichion and tragus points.

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