ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 08, Issue, 09, pp.23033-23036, September, 2018

ORIGINAL RESEARCH ARTICLE OPEN ACCESS

PERIORAL SOFT TISSUE EVALUATION IN VARIOUS SKELETAL PATTERNS: A LATERAL CEPHALOMETRIC STUDY

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ARTICLE INFO

Article History:
Received 20th June, 2018
Received in revised form
24th July, 2018
Accepted 06th August, 2018
Published online 30th September, 2018

Key Words:
Lower Lip,
Soft Tissue,
Perioral.

ABSTRACT

Introduction-The importance of the facial aesthetics to the practice of orthodontics had its origin since beginning of the specialty. This study aims to assess the perioral soft tissue in individual having ANB angle 0-2°,3-5°, and more than 5° and Intergroup and Intragroup comparison of perioral soft tissue between the three groups. Material and Method-Lateral cephalogram of 103 patients were randomly selected between the age 18-29 years which were divided into three groups Group I having ANB angle (0-2°), Group II having ANB angle (3-5°) and Group III having ANB angle >5° respectively. All the respective parameters comprising of perioral soft tissue were measured. **Result:** No statistical difference in the soft tissue changes were found among Group I and Group II while differences between Group I and Group III were found to be statistically significant only for Lower Lip Thickness, and difference between Group II and Group III were found to be statistically significant only for Lower Lip Thickness. **Conclusion:** The present study found important correlations when analyzing associations between the perioral soft tissue parameters in various skeletal patterns.

Citation: Ravi Kumar Srivastava. 2018. "Perioral soft tissue evaluation in various skeletal patterns: A lateral cephalometric study", *International Journal of Development Research*, 8, (09), 23033-23036.

INTRODUCTION

In 1900, Edward H. Angle believed that an aesthetic or a "harmonious" face required a full complement of teeth. He discussed his "line of harmony," a vertical line that touches glabella, subnasale, and pogonion in the profile "with perfect harmony. His non extraction philosophy dominated for the next four decades (Angle, 1900). Calvin Case, Matthew Cryer believed that the esthetic harmony of the face should be the most important objective in orthodontic treatment, and that extraction of teeth was sometimes necessary to achieve that goal. Objective methods to evaluate the soft tissue profile had its origins in the fields of art and then anthropology (Case, 1908). In 1938, Brodie *et al* used cephalometrics as a clinical tool to analyze treated patients (Brodie, 1941). Various researchers like Down's, Steiner's, Burstone studied the harmonious relation between different skeletal patterns and its effect on underlying perioral soft tissue. The facial profile changes throughout life occur as a result of normal growth and aging.

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Several growth patterns are present in the aging individual and the soft tissue profile may on occasion mask or aggravate the appearance of the underlying skeletal pattern. Therefore, understanding the changes that occur in the integumental profile, through the normal process of growth and aging, in the various craniofacial skeletal types is essential. To obtain the balance and harmony of the soft tissue facial profile in orthodontic treatment, it is necessary to identify the characteristics of overlying soft tissues according to the horizontal and vertical skeletal patterns (Downs, 1948). This present study is designed to assess the perioral soft tissue in individual having ANB angle 0-2°, 3-5°, and more than 5° as well as comparing the perioral soft tissue between the three groups.

MATERIALS AND METHODS

The study was conducted on subjects with age ranging from 18- 29 years. Written informed consents were obtained from the patients and parents of all subjects. Lateral cephalogram of 103 patients were selected for the study who fulfilled the inclusion criteria and radiographic standardization was maintained as patients were placed in the standing position

Figure 1. Subject in Natural Head Position

Table 1. Intragroup Comparison of Soft Tissue Parameters

Soft tissue Variable	Group I (n=37)		Group II (n=37)		Group III (n=29)		ANOVA	
	Mean	SD	Mean	SD	Mean	SD	F	'p'
ANB	1.35	0.68	3.68	0.63	7.34	1.86	230.646	<0.001
U1-L1	113.08	15.40	112.81	21.92	114.79	13.96	0.116	0.891
B.U.L.T	11.14	3.75	10.05	2.88	10.90	3.51	1.024	0.363
U.L.T	14.24	3.25	13.62	2.71	12.97	2.18	1.710	0.186
U.L.S	4.14	2.23	3.84	2.05	3.72	2.70	0.288	0.751
L.L.T	14.57	5.77	14.70	5.19	10.38	2.94	7.837	0.001
B.L.L.T	12.22	3.69	11.27	2.26	11.72	2.23	1.018	0.365
C.T	10.59	2.10	10.76	2.09	10.34	1.80	0.341	0.712
C.T'	7.30	2.77	6.84	2.53	6.69	1.79	0.576	0.564
S.N-H	9.35	2.19	9.43	2.28	9.52	2.69	0.040	0.961
LL-H	4.22	2.78	4.73	3.17	3.72	2.30	1.052	0.353
E-Upper	1.32	2.48	1.08	2.19	0.76	2.12	0.500	0.608
E-Lower	3.05	3.22	3.22	3.31	2.79	3.63	0.129	0.879
U.L.L	17.92	2.76	18.27	2.63	17.83	3.40	0.222	0.801
Stmi-B	21.59	3.78	21.65	3.73	21.10	5.94	0.141	0.869
Sn-Me'	59.81	7.12	59.92	6.93	60.28	10.25	0.029	0.972
ANS-Me	60.35	5.25	61.73	5.24	62.86	5.96	1.755	0.178
Nasolabial	94.14	13.29	94.11	13.04	97.55	10.83	0.778	0.462
H-angle	20.27	3.37	20.86	3.47	21.86	3.24	1.823	0.167

with the Frankfort Horizontal plane parallel to the floor. The head of the patient was erect as seeing in his own eye in mirror as shown above in Fig. 1. All of the cephalogram were recorded with the same exposure parameters (Kvp -80,mA-10 exposure time 0.5 sec). All the cephalogram were traced twice with the same operator with the minimum gap of two weeks, and the data were recorded on manual data sheet then. They were divided in three groups according to ANB criteria as following –

- Group I having ANB angle (0-2°).
- Group II having ANB angle (3-5°).
- Group III having ANB angle(>5°)

Soft tissue parameters

1. Basic upper lip thickness, linear distance from 3 mm below A-point to subnasale.
2. Upper lip thickness, linear distance from the most prominent labial point of the maxillary incisor (U1) to labralesuperius (Ls).
3. Upper lip strain, the difference between basic upper lip thickness and upper lip thickness.
4. Lower lip thickness, linear distance from the most prominent labial point of the mandibular incisor (L1) to labraleinferius (Li)
5. Basic lower lip thickness, linear distance from B-point to the deepest point of the labiomental fold
6. Chin thickness-H, linear distance from pogonion to its sagittal projection on the soft tissue (Pog-Pog')
7. Chin thickness-V, linear distance from menton to its vertical projection on the soft tissue (Me-Me')
8. Subnasale to H-line
9. Lower lip to H line
10. Ricketts' E-line to upper lip
11. Ricketts' E-line to lower lip
12. Upper lip length, vertical distance from subnasale to the lowest point of the upper lip (Stms) perpendicular to the Frankfort horizontal plane (FH plane)
13. Lower lip length, vertical distance from the highest point of the lower lip (Stmi) to the soft tissue B-point perpendicular to the FH plane
14. Soft tissue contour ,total length of lower facial profile (subnasale-Me') .
15. Hard tissue contour ,total length of hard tissue contour(anterior nasal spine-Me), and contour ratio was a percentage ratio of soft tissue contour to hard tissue contour.
16. Nasolabial angle
17. H-angle, angle formed by H-line and soft tissue nasion-Pog line.

Table 2. Between Group Comparison of Soft Tissue Parameters

Soft tissue Variable	Group I Vs. Group II			Group I Vs. Group III			Group II Vs. Group III		
	Mean diff.	SE	p	Mean diff.	SE	p	Mean diff.	SE	P
ANB	-2.32	0.26	0.000	-5.99	0.28	0.000	-3.67	0.28	0.000
U1-L1	0.27	4.11	0.998	-1.71	4.39	0.920	-1.98	4.39	0.894
B.U.L.T	1.08	0.79	0.360	0.24	0.84	0.957	-0.84	0.84	0.577
U.L.T	0.62	0.65	0.605	1.28	0.69	0.160	0.66	0.69	0.611
U.L.S	0.30	0.54	0.845	0.41	0.57	0.754	0.11	0.57	0.979
L.L.T	-0.14	1.14	0.992	4.19	1.22	0.002	4.32	1.22	0.002
B.L.L.T	0.95	0.66	0.331	0.49	0.71	0.767	-0.45	0.71	0.797
C.T	-0.16	0.47	0.936	0.25	0.50	0.872	0.41	0.50	0.689
C.T'	0.46	0.57	0.698	0.61	0.61	0.577	0.15	0.61	0.968
S.N-H	-0.08	0.55	0.988	-0.17	0.59	0.957	-0.08	0.59	0.989
LL-H	-0.51	0.65	0.712	0.49	0.70	0.760	1.01	0.70	0.322
E-Upper	0.24	0.53	0.891	0.57	0.57	0.579	0.32	0.57	0.836
E-Lower	-0.16	0.78	0.977	0.26	0.84	0.948	0.42	0.84	0.869
U.L.L	-0.35	0.68	0.862	0.09	0.72	0.991	0.44	0.72	0.813
Stmi-B	-0.05	1.04	0.999	0.49	1.11	0.898	0.55	1.11	0.876
Sn-Me'	-0.11	1.87	0.998	-0.47	2.00	0.971	-0.36	2.00	0.983
ANS-Me	-1.38	1.27	0.524	-2.51	1.35	0.157	-1.13	1.35	0.681
Nasolabial	0.03	2.92	1.000	-3.42	3.11	0.518	-3.44	3.11	0.513
H-angle	-0.59	0.78	0.729	-1.59	0.84	0.143	-1.00	0.84	0.460

RESULTS

Out of 103subjects, Group I comprised of 37 subjects having ANB 0-2°,Group II comprised of 37 subjects having ANB 3-5°and,Group III comprised of 29 subjects having ANB >5°. Majority of overall (n=66; 64.1%) as well as of Group I (59.5%), Group II (59.5%) and Group III (75.9%) were female and rest were males. Intragroup comparison of Soft Tissue Parameters were done, only the lower lip thickness of the above three groups showed statistically significant difference as shown in Table 1. Difference between Group I & Group III were found to be statistically significant only for Lower Lip Thickness (4.19±1.22; p=0.002), rest of the variables did not show significant differences as shown in Table 2. Difference between Group II & Group III were found to be statistically significant only for Lower Lip Thickness (4.32±1.22; p=0.002), rest of the variables did not show significant differences as shown in Table 2.

DISCUSSION

Soft tissue parameters were compared between Group I and Group II, Group I and Group III, and Group II and Group III. Differences between Group I and Group III were found to be statistically significant only for Lower Lip thickness, rest of the variables did not show any significant differences. Difference between Group II and Group III were found to be statistically significant only for Lower Lip Thickness, rest of the variables did not show any significant difference. This finding was in accordance with the study conducted by Nanda RS *et al*. (Ram, 1989), in which they observed growth changes cephalometrically in 40 caucasians. Soft tissue variables of females and males were compared in Group I having (ANB 0-2°), difference were found to be statistically significant only for Upper Lip Thickness, Chin Thickness, E-Upper and Nasolabial angle and in Group II having (ANB 3-5°), difference were found to be statistically significant only for Upper Lip Thickness, Lower Lip Thickness, Chin Thickness, SN-H,E-Upper ,Upper Lip Length, ANS-Me and Nasolabial angle. This study was correlated with that of Hoffelder LB *et al*, in which the nose showed the greatest increase in thickness and length in both sexes. Upper lips tended to reduce in females. Upper lip length showed slight increase, and base of the upper lip showed small increase for both sexes.

The lower lip had moderate increases in all measurements, and its thickness showed sexual dimorphism at almost all ages. The soft tissues of the chin increased in both thickness and length, with no sexual dimorphism. In this study, the lower lip thickness was significantly greater in Group II and Group III. The greater lower lip thickness could be interpreted as the soft tissue characteristic of skeletal class II. This was in accordance with the study done by Mamandras AH^2 who stated that the maxillary and mandibular lips, under the influence of growth, increase in both dimensions with the advancement of age. During the period studied, the length and thickness of the lips of the male subjects exhibited greater increase, both proportionally and numerically, than the corresponding dimensions of female lips. Therefore, clinicians should evaluate lip strain and lip thickness based on the skeletal pattern as well as the dental inclination to establish the treatment objectives for a balanced facial profile, and post treatment stability.

Conclusion

The present study found important correlations when analyzing associations between the perioral soft tissue parameters in various skeletal patterns. The measurements of perioral soft tissue thickness were correlated with the inclination and the anteroposterior position of the maxillary and mandibular incisors along with facial depth.Clinicians need to evaluate lip strain and lip thickness based on the skeletal pattern as well as dental inclination to obtain balance in the perioral muscle activity.

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