

SOFT TISSUE PROFILE OF A PAKISTANI SAMPLE WITH CLASS I OCCLUSION

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ABSTRACT

Comprehensive soft tissue analysis is an important component of cephalometric analysis. The purpose of this study was to evaluate soft tissue profile of Pakistani adults with Class I occlusion. It was a prospective cross-sectional study, carried out at the Department of Orthodontics, de, Montmorency Institute of Dental Sciences/ Punjab Dental Hospital, Lahore. Standardized lateral cephalometric radiographs were taken of 50 selected Pakistanis (25 males and 25 females) within age range 18 through 23 years having normal occlusion. The database were developed in SPSS 10.0 for Windows. The results showed that the Pakistani sample had proclined lower incisors, a convex profile with lesser value of Z-angle. It was concluded that soft tissue profile of an individual depends on age, gender and ethnic group of that individual.

Key words: Soft tissue Analysis, Soft tissue profile, Class I Occlusion, Ethnic differences, Cephalometrics, Facial profile.

INTRODUCTION

Facial esthetics has long been recognized as one of the most important goals of orthodontic treatment. To accomplish these goals knowledge of normal craniofacial structures is essential. The study of craniofacial structures from lateral cephalogram involves an evaluation of the hard tissues as well as the over lying soft tissue integument.¹

In orthodontic practice, a diagnosis is determined in part by comparing a patient's cephalometric measurement to standard values.²⁻⁷ Lateral cephalometric norms, however, may be specific to an ethnic group and cannot always be applied to other ethnic groups.²⁻⁹ Since a large body of research was carried out on Caucasians, attempts have been made to investigate the differences among various ethnic groups.¹⁰ There are few studies carried out to establish Cephalometric norms of Pakistani population, soft tissue profile evaluation has not received due consideration.¹¹⁻¹⁴ Hence the purpose of this study is to evaluate the cephalometric characteristics of soft tissue profile of patients with

normal occlusion in a sample of Pakistani population. This study will serve as a diagnostic tool in treatment planning of orthodontic patients.

METHODOLOGY

This study was carried out at department of Orthodontics, de, Montmorency Institute of Dental Sciences/ Punjab Dental Hospital, Lahore. Study was carried out on 50 adults (25 males and 25 females) with age ranged from 18 to 23 years. The consecutive sampling technique was applied and the sample was selected from the Orthodontic outpatient department, de' Montmorency Institute of Dental Sciences/ Punjab Dental Hospital, Lahore. Patients were selected on the basis of Class-I skeletal and dental relationship with IOTN grade 1 or 2. The subjects aged 18 through 23 years. Patients with previous history of orthodontic treatment or any craniofacial anomaly or trauma were excluded. All the patients were explained about purpose of study and consent was taken. The patients were informed for the amount of radiation exposure related to cephalometric radiography. The standardized radiographic technique

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was applied to all the subjects and the radiographs were recorded in natural head position. All the cephalograms were traced manually on acetate paper as shown in Figure 1.

Statistical Analysis

The database of all the measurements was developed in SPSS info version 10.0 software statistical packages.

The method error was calculated and no statically significant difference recorded between first and second tracing on applying the paired t-test.

RESULTS

A total of 50 patients with Class I relationship were included in this study. The mean age of the sample was 21.71 ± 1.27 years, with a range of 18-23 years.

The arithmetic mean, standard deviation, standard error mean, minimum and maximum of skeletal, dento-alveolar and soft tissue relationships for all the 50 patients are presented in table 1.

The sagittal skeletal analysis indicates that the sample was Class-I as shown by values of SNA ($81.62^\circ \pm 2.38^\circ$) and SNB ($78.89^\circ \pm 2.33^\circ$). The vertical pattern was assessed by parameter of MMA ($22.00^\circ \pm 4.49^\circ$) that showed the low angle tendency of the sample when compared to Caucasian norms.

The dental analysis showed that upper incisors were well within normal range as shown by UI-SN and UI-Pal ($109.82^\circ \pm 3.68^\circ$ and $102.26^\circ \pm 3.76^\circ$ respectively). For the angulations of lower incisors the mean value for IMPA was $96.86^\circ \pm 5.63^\circ$.

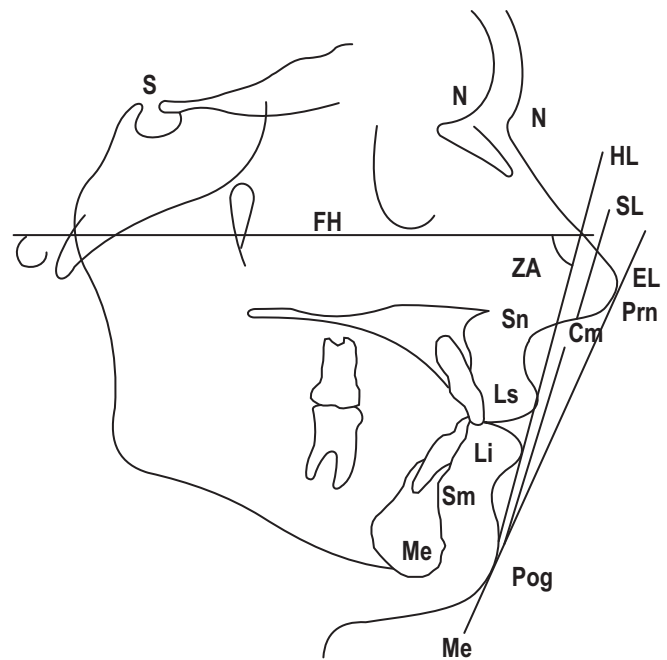


Fig 1: EL, tangent line joining Pronasale to Soft Tissue Pogonion; SL, line joining point at the center of the "S" shaped curve between the Subnasale and Pronasale to Pog'; HL, line joining Ls to Pog'; ZL, line joining soft tissue Pogonion and more prominent point on upper or lower lip (i.e. Pog' to Ls or Li); MLA, Mentolabial Angle (angle between points Li-Sm-Pog'); NLA, Nasolabial Angle (Ls-Sn-Cm). H-Angle; Holdaway Angle (Angle between N' Pog'-Ls Pog' planes); ZA, Z-Angle (Angle formed between Frankfurt Horizontal and Z line).

TABLE 1: HARD AND SOFT TISSUE CHARACTERISTICS OF THE SAMPLE

Cephalometric Parameter	Minimum	Maximum	Mean	Standard deviation
SNA	77.0	88.0	81.62	2.38
SNB	74.5	84.0	78.89	2.33
ANB	.0	4.0	2.81	1.26
MMA	12	30	22.00	4.49
UI-SN	95	112	102.26	3.76
UI-Pal	101	115	109.82	3.68
IMPA	85	105	96.86	5.63
NLA	86	121	100.68	6.15
MLA	108	145	124.02	7.89
H-angle	9	21	14.45	2.78
Z-angle	62	83	72.85	4.55
Ls-E line	-8.0	-2.0	-4.55	1.59
Li-E line	-5.0	1.0	-2.15	1.64
Ls-S line	-3.0	1.0	-0.95	1.13
Li-S line	-3.0	2.5	0.00	1.19

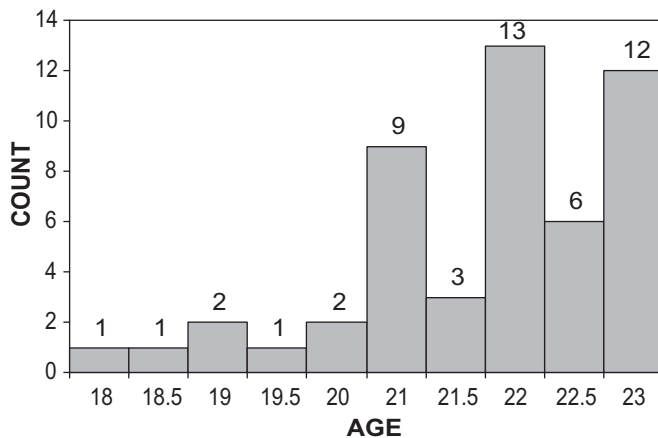


Fig 2: Histogram of age.

The parameter indicating the angle between nose and upper lip (NLA) was $100.68^\circ \pm 6.15$ while the parameter indicating angle between chin and lower lip (MLA) was $124.02^\circ \pm 7.89^\circ$. The mean values for H-angle and Z-angle were $14.45^\circ \pm 2.78^\circ$ and $72.85^\circ \pm 4.55^\circ$ respectively.

The antero-posterior position of the lips was evaluated with reference to E-line and S-line. The mean values of Ls-E line and Li-E line were $-4.55 \text{ mm} \pm 1.59$ and $-2.15 \text{ mm} \pm 1.64$ respectively. The mean values for Ls-S line and Li-S line were $-0.95 \text{ mm} \pm 1.13$ and $0.00 \text{ mm} \pm 1.19$ respectively.

DISCUSSION

This study was carried out on adults with mean age of 21.71 ± 1.27 years ranging from 18 to 23 years. Negligible amount of growth is expected in this age group.¹⁵

The antero-posterior skeletal relationships were suggestive of Class I skeletal relationship when compared to normal values suggested by Steiner⁴ and Bjork¹⁶ for the Caucasian population i.e. 82° for maxilla and 80° for mandible. The mean value of maxillary-mandibular plane (MMA) angle for the sample was $22.00^\circ \pm 4.49^\circ$, that is at the lower limit of normal range ($25^\circ \pm 3^\circ$).

Tweed¹⁷ proposed lower incisors should be upright on mandibular bases for optimum esthetics and stability of the results. It is interesting to note that there was marked difference in value of IMPA between Caucasian norms reported by Tweed ($90^\circ \pm 5^\circ$) and Down¹⁸ ($91.40^\circ \pm 3.8^\circ$) and present study ($96.86^\circ \pm 5.63^\circ$). However other studies on Pakistani sample support our finding that value of IMPA is greater than that of Caucasian norms.^{12,13}

According to Holdaway^{19,20} ten degrees is ideal value for H angle with range of 7° to 14° . These obser-

vations have been based on the patients from Northern European ancestry. The value of H angle in our study was $14.45^\circ \pm 2.78^\circ$, indicating relative convexity of soft tissue profile. The values for H angle in this study were within normal limits suggested by Holdaway and Basciftci.²¹

Merrifield²² found the average value of Z-angle in adults to be $80^\circ \pm 5^\circ$. In the present study the average Z-angle value ($72.85^\circ \pm 4.55^\circ$) was considerably lesser than that reported by Merrifield, indicating relative convexity of soft tissue profile.

Ricketts²³⁻²⁵ suggested that the lower lip was approximately two millimeters and the upper lip approximately four millimeters posterior to a line from the nose to the chin. His study was carried out on adolescents. He also found that the lip convexity decreases consistently from the deciduous dentition age to the age of full dentition and lips progressively become less prominent. Later studies carried on adult sample showed that lips are more posterior to E-line than younger people. The adult values of Ls-E line in the studies of Bishara¹ et al, Kapila et al²⁶ and Zylinski¹¹ et al were -5.18 mm , -4.25 mm and -7.1 mm respectively.

The lip position depends not only on age and sex of the patient but also on ethnic group of patient. Miyajima et al¹⁰ found both upper and lower lips 3 to 4 mm more protrusive relative to the esthetic line in Japanese men than in European-American men. A less prominent chin was observed in the Japanese male group. The mean value for E-line to upper lip in present study was $-4.55 \text{ mm} \pm 1.59 \text{ mm}$ that was slightly less than normal value ($-4 \text{ mm} \pm 2 \text{ mm}$), this indicated that upper lip was slightly more retrusive. The reason for this may be that the mean age of the sample is greater than reported by Ricketts.

The position of lower lip to E-line was within the normal range of Rickett's norms (-2 mm). The value of Li-E line in the studies of Bishara¹ et al, Kapila et al²⁶ and Zylinski²⁷ et al were -3.98 mm , -2.75 mm and -5.2 mm respectively.

Fitzgerald²⁸ suggested that angle formed between base of nose and upper lip (NLA) provides inadequate information as it does not reveal which component is responsible for the variability. Therefore it is important to analyze each component of this angle to assist in the differential diagnosis of normal from its variation. The mean value for the nasolabial angle in the present study was $100.68^\circ \pm 6.15^\circ$ that was within the normal range of $102^\circ \pm 10^\circ$.

Zylinski et al²⁷ compared nasolabial angle of boys and adult men. The sample comprised of 31 boys aged

5 to 10 years old (mean age = 7.6 years) and 29 men aged 22 to 32 years old (mean age = 26.2 years). Nasolabial angle noted in pre-adolescent boys and adult men were $111.5^\circ \pm 7.8^\circ$ and $110.8^\circ \pm 7.6^\circ$. He concluded that nasolabial angle of an individual remains constant. Hashim and AlBarakati²⁹ compared nasolabial angle of 30 adult Saudi males ($96.2^\circ \pm 11.1^\circ$) to the male sample of Zylinski²⁷ and noted statistically significant differences ($p=0.000$) between Caucasian and Saudi sample.

According to Lines et al³⁰ the mentolabial angle should ideally measure approximately 130° . The value measured for the mento-labial angle was $124.02^\circ \pm 7.89^\circ$ that was in agreement with those reported by Zylinski²⁷ ($124.3^\circ \pm 13.1^\circ$), Scheideman³¹ ($124.8^\circ \pm 11^\circ$), Satravaha³² ($134.20^\circ \pm 10.66^\circ$), Hashim²⁹ ($120^\circ \pm 12^\circ$), Lines et al³⁰ (130°), Formby³³ (125.75°).

The standard deviation for MLA was 7.89° which was highest in this study. This high value was in accord with other studies^{28,30,32} indicating these measurements showed a great degree of individual variability and indicated that comparisons should be made with the range of normal values rather than with the mean.

CONCLUSIONS

Following conclusions can be drawn from the study on Pakistani sample with Class I occlusion.

Low angle tendency was observed on evaluation of vertical pattern of the sample (as indicated by MMA). Lower incisors were slightly proclined when evaluated in relation to mandibular plane. The sample had slightly convex soft tissue profile as suggested by Z-Angle and H-Angle. The adult Pakistani sample had retrusive lips when seen with reference to E-line. This study confirmed the notion that Pakistani sample had distinct cranio-facial features that should be carefully considered by orthodontists and orthognathic surgeons while setting goals of the treatment.

REFERENCES

- Bishara SE, Hession TJ, Peterson LC. Longitudinal soft-tissue profile changes: A study of three analyses. *Am J Orthod* 1985; 88(3): 209-23.
- Hwang HS, Kim WS, McNamara JA Jr. Ethnic differences in soft tissue profile of Korean and European-American adults with normal occlusion and well balanced faces. *Angle Orthod* 2002; 72: 72-80.
- Merrifield LL. The profile line as an aid in critically evaluating facial esthetics. *Am J Orthod* 1966; 52: 804-22.
- Steiner CC. The use of cephalometrics as an aid to planning and assessing orthodontic treatment. *Am J Orthod* 1960; 46: 721-35.
- Ricketts RM. Esthetics, environment and the law of lip relation. *Am J Orthod* 1968; 54: 272-89.
- Burstone CJ, James KB, Legan H, Murphy GA, Norton LA. Cephalometrics for Orthognathic surgery. *J Oral Surg* 1978; 36: 269-77.
- Holdway RA. A soft tissue cephalometric analysis and its use in orthodontic treatment planning Part I. *Am J Orthod* 1983; 84: 1-28.
- McNamara JA Jr. A method of cephalometric evaluation. *Am J Orthod* 1984; 86: 449-69.
- Richardson ER. Racial differences in dimensional traits of the human face. *Angle Orthod* 1980; 50: 301-11.
- Miyajima K, McNamara JA Jr, Kimura T, Murata S, Iizuka T. Craniofacial structure of Japanese and European-American adults with normal occlusions and well-balanced faces. *Am J Orthod* 1996; 110: 431-38.
- Burki S, Faisal M. In search of normal facial profile. *Pak Oral Dent J* 2000; 20: 165-74.
- Hamid W, Asad S. Prevalence of skeletal components of malocclusion using composite cephalometric analysis. *Pakistan Oral & Dent Jr* 2003; 23: 137-44
- Hamid W, Asad S. Vertical reference plane: used to assess cephalometric features of a Pakistani sample. *Pakistan Oral & Dent Jr* 2005; 25: 193-200
- Zaib F, Israr J, Ijaz A. Photographic angular analysis of adult soft tissue facial profile. *Pakistan Orthod Jr* 2009; 1: 34-39
- Subtelny JD. The soft tissue profile, growth, and treatment changes. *Angle Orthod* 1961; 31: 105-122.
- Björk A. The face in profile: an anthropological x-ray investigation on Swedish children and conscripts. *Swed Dent J* 1947; 40(5): 1-5.
- Tweed CH. The Frankfort-Mandibular Incisor Angle (FMIA) in Orthodontic Diagnosis, Treatment Planning and Prognosis. *Angle Orthod* 1954; 24(3): 121-69.
- Downs WB. Analysis of the Dentofacial Profile. *Angle Orthod* 1956; 42: 191-212.
- Holdaway RA. A soft-tissue cephalometric analysis and its use in orthodontic treatment planning Part I. *Am J Orthod* 1983; 84: 1-28.
- Holdaway RA. A soft-tissue cephalometric analysis and its use in orthodontic treatment planning Part II. *Am J Orthod* 1984; 85: 279-93.
- Basciftci FA, Uysal T, Buyukerkmen A. Determination of Holdaway soft tissue norms in Anatolian Turkish adults. *Am J Orthod* 2003; 123(4): 395-400.
- Merrifield LL. Profile line as an aid in critically evaluating facial esthetics. *Am J Orthod* 1966; 52: 804-22.
- Ricketts RM. Planning Treatment on the Basis of the Facial Pattern and an Estimate of its Growth. *Angle Orthod* 1957; 27(1): 14-37.
- Ricketts RM. A foundation for cephalometric communication. *Am J Orthod* 1960; 46: 330-57.
- Ricketts RM. Esthetic, environment and law of lip relations. *Am J Orthod* 1968; 54: 272-89.
- Kapila S. Selected cephalometric angular norms in Kikuyu children. *Angle Orthod* 1989; 59(2), 139-44.
- Zylinski CG, Nanda RS, Kapila S. Analysis of soft tissue facial profile in white males. *Am J Orthod* 1992; 101: 514-518.
- Fitzgerald JP, Nanda RS, Currier GF. Evaluation of nasolabial angle. *Am J Orthod* 1992; 102(4): 328-34.
- Hashim HA, AlBarakati SF. Cephalometric soft tissue profile analysis between two different ethnic groups: a comparative study. *J Contemp Dent Pract* 2003; 4(2): 60-73.
- Lines PA, Lines RR, Lines CA. Profilometrics and facial esthetics. *Am J Orthod* 1978; 73: 648-57.
- Scheideman GB, Bell WH, Legan HL, Finn RA, Reisch JS. Cephalometric analysis of dentofacial normals. *Am J Orthod* 1980; 78(4): 404-20.
- Satravaha S, Schlegel KD. Significance of integumentary profile. *Am J Orthod* 1987; 92(5): 422-26.
- Formby WA, Nanda RS, Currier GF. Longitudinal changes in the adult facial profile. *Am J Orthod* 1994; 105(5): 464-76.