ORIGINAL ARTICLE

SOFT TISSUE ANALYSIS OF AESTHETICALLY PLEASING FACES

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ABSTRACT

Soft tissues analysis in Orthodontics, not only plays important role to assess facial esthetics, rather it is also one of the crucial steps in determining the stability and success of treatment outcome. This cross sectional study was carried out in sample of local Karachi population with esthetically pleasing faces having Class I skeletal base with fully erupted permanent teeth & no history of previous orthodontic treatment. Cephalometric soft tissue analysis was done using the Nasolabial angle, E-Line and S-Line for 91 subjects (68 females and 23 males) who met the inclusion criterion. Mean value of nasolabial angle was found to be 101.6° ± 14.5°. Upper & lower lip prominence in accordance to E-Line was 2.91± 2.45mm &1.25± 2.67mm respectively. Upper and lower lips were found to be slightly protrusive with reference to the norms of E-Plane proposed by Rickets. The anteroposterior position of upper & lower lip in relation to S-Line was 0.0± 2.5 mm &- 0.71± 2.5 mm respectively. Both the lips were found to lie close to the norms of S-Line proposed by Steiner's. Thickness of soft tissues varies from one patient to other, which is one of the major factors in determining the profile of patients. This study was conducted in a sample of Karachi population and these results do not necessarily exhibit the trend of entire Pakistani population as soft tissue thickness varies in different ethnic groups.

Key Words: *Soft Tissue, Nasolabial Angle, E-Line, S-Line, Class I, Lip Prominence.*

INTRODUCTION

The planning of orthodontic treatment does not depend only on skeletal and dental relationship, the soft tissue profile has a immense influence on it as well.[1] The essential form and synchronization of facial features relies on the soft tissue adaptation over the underlying skeleton. While carrying out comprehensive diagnosis and making appropriate treatment plan, both hard and soft tissue evaluation is important to establish facial harmony.[2] For adequate post treatment retention, soft tissue interpretation is vital as force exerted by oral musculature plays a fundamental role in determining position of the teeth thus avoiding post orthodontic relapse.[3,4] Traditionally in orthodontic diagnosis and treatment planning consideration was given to occlusion and hard tissue relationships only, however in modern orthodontics soft tissue assessment is given its due share.[5] Facial appearance is subjective with age, gender, culture, and ethnicity.[5,6] Various studies conducted on adaptation of soft tissues to underlying skeleton holds significance and varies from one ethnic group to other.[7-13] Currently there are various parameters for soft tissue analyses that offers orthodontist an important tool to determine facial esthetics. In the current study, we took three most important parameters i.e. Nasolabial angle, E-line and S-line to analyze soft tissues of the skeletally Class I individuals with aesthetically pleasing facial profiles.

METHODOLOGY

This cross sectional study was carried out from March 2012 to February 2013. Patients from both genders, ranging from 15 -30 years of age with esthetically pleasing profiles, full set of permanent teeth were included in the study. None of the subjects had cleft lip and/or palate, previous history of orthodontic treatment or any kind of syndrome. Informed consent was obtained from the patients. Lateral cephalogram of the subjects were taken from the right side of the face, at a distance of 5-ft from mid-sagittal plane, in natural head position with the Frankfort horizontal plane parallel to the floor. Lips of the patients were at rest and teeth in occlusion when exposure was made at

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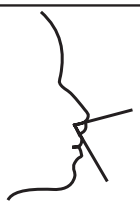
80-90 Kvp and 32 mA for 1.4 seconds. The soft-tissue outline and bony structures of all cepahlograms were manually traced using 4H pencil on a transparent cellulose acetate sheet in a dark room over an Illuminator. Cephalometric landmarks were identified and along with soft tissue analysis mentioned in Table 1, sagittal analysis for all the patients was also done to determine the underlying skeletal base. Data tabulation and basic descriptive analysis was carried out using SPSS version 20.

RESULTS

Out of 267 subjects assessed and examined, only 91 subjects (68 Females and 23 Males) fulfilled inclusion criteria. Mean value of Nasolabial angle was found to be 101.6º ± 14.5º (Fig 1) with males at 102º ± 14.9º and females at 101.3º ± 14.4º (Table 2). Distance from E-Line to upper lip was 2.91± 2.45 mm (Fig 2) while to lower lip it was found to be 1.25 ± 2.67 mm (Fig 3). In male subjects mean value of E-line to upper lip was 2.83 ± 2.34 mm and to lower lip was found to be 1.74 ± 2.2 mm. While in female subjects mean value of E-line to upper lip was 2.94 ± 2.5 mm and to lower lip it was found to be 1.09 ± 2.8 mm (Table 2). Distance from S-Line to upper lip was 0.0± 2.5 mm (Fig 4) while to lower lip it was found to be -0.71 ± 2.5mm (Fig 5). In male subjects mean value of S-Line to upper lip was 0.17± 2.93mm and to lower lip was found to be -0.17 ± 2.6 mm. While in female subjects mean value of S-Line to upper lip was -0.06 ± 2.36 mm and to lower lip it was found to be - 0.90 ± 2.58 mm. (Table 2)

TABLE 1: DESCRIPTION OF ANGULAR & LINEAR MEASUREMENT TAKEN FOR THIS STUDY[14]

Angular Measurement	Nasolabial Angle	Angle formed by joining nasal columella and upper lip slope.	
Linear Measurements	Steiner's S-Line	Line was drawn from midpoint between Subnasale (Sn) & tip of the nose to soft tissue Pogonion (Pog)	
	Rickets E-Line	Line was drawn from nasal tip to Soft Tissue Pogonion (Pog)	

DISCUSSION

Orthodontic diagnosis should not be completed based solely on hard tissue information since changes in dental positions cause alterations in the facial profile. Orthodontic diagnosis and treatment plan should consider the soft tissue profile of the patient and must take account of the perspectives of orthodontic alterations based on soft tissue analysis.[11,15] The concept of facial esthetics is becoming increasingly important as it is one the most important attribute on the basis of which opinions and perceptions of character and social ability is conceived.[16-21] To achieve high levels of patient satisfaction after orthodontic treatment, proper recognition of dental and facial esthetic defects at the beginning of treatment is essential. In order to identify these defects, orthodontist must have an idea of appropriate esthetic norms. Esthetic features are different from one race to another, and this should be considered during the treatment planning. But one should keep in mind that norms developed for any population should only be used as a reference instead of considering it as an absolute value because factors such as age, gender, ethnicity and face type can contributes to facial variation.[22]

TABLE 2: DESCRIPTIVE STATISTICS OF NASOLABIAL ANGLE, E-LINE & S-LINE ACCORDING TO GENDER

Gender	Nasolabial Angle		E-Line		S-Line	
			Upper Lip	Lower Lip	Upper Lip	Lower Lip
Male	Mean	102.6°	2.83 mm	1.74 mm	0.17 mm	- 0.17 mm
	Std. Deviation	14.96°	2.34 mm	2.2. mm	2.93 mm	2.6 mm
	Minimum	65°	-1 mm	-3 mm	- 4 mm	- 5 mm
	Maximum	124°	6 mm	6 mm	6 mm	6 mm
Female	Mean	101.3°	2.94 mm	1.09 mm	- 0.06 mm	- 0.90 mm
	Std. Deviation	14.46°	2.5 mm	2.8 mm	2.36 mm	2.58 mm
	Minimum	64°	-6 mm	-5 mm	-6 mm	-6 mm
	Maximum	135°	7 mm	6 mm	5 mm	4 mm

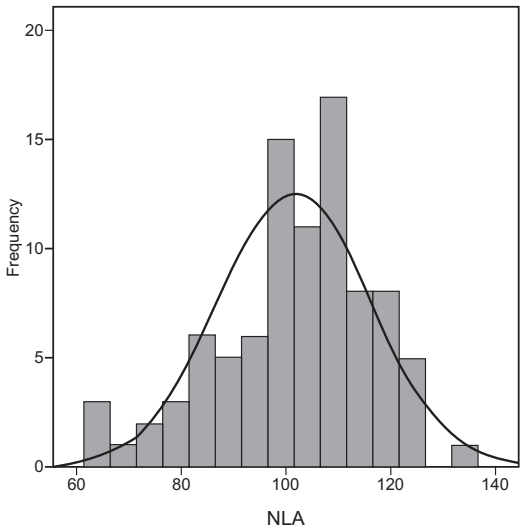


Fig 1: Histogram showing Frequency of Distribution of Nasolabial Angle in studied sample

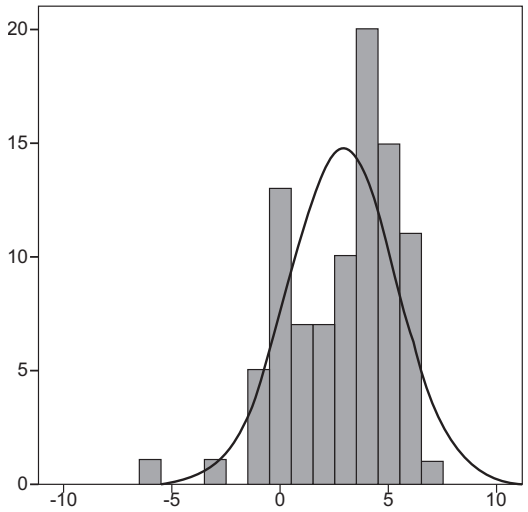


Fig 2: Histogram showing Frequency of Distribution of Distance of Upper lip to E-Line in studied sample

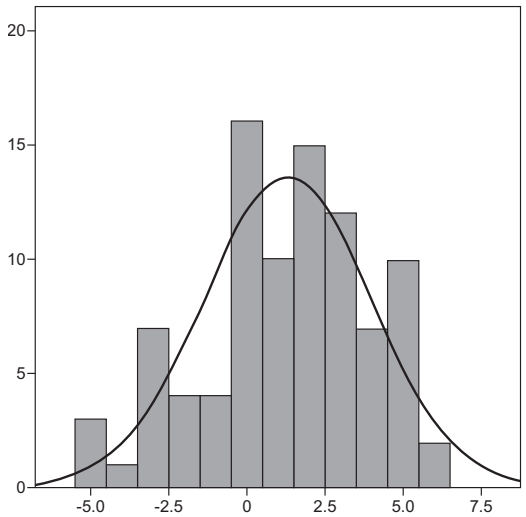


Fig 3: Histogram showing Frequency of Distribution of Distance of Lower Lip to E-Line in studied sample

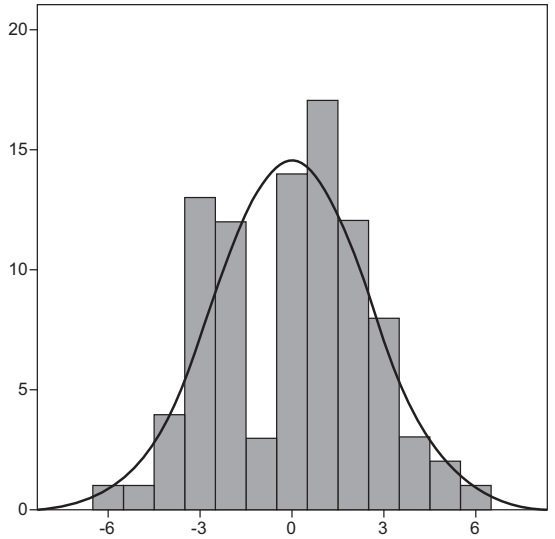


Fig 4: Histogram showing Frequency of Distribution of Distance of Upper Lip to S-Line in studied sample

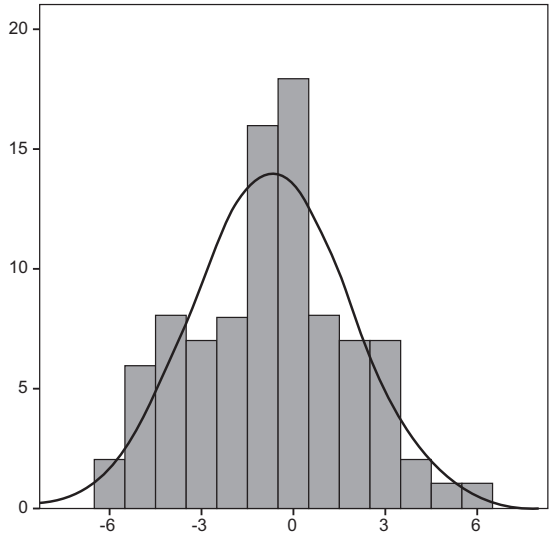


Fig 5: Histogram showing Frequency of Distribution of Distance of Lower Lip to S-Line in studied sample

The nose-lip-chin relationships are exceedingly important in determining the facial esthetics.[23] Nasolabial angle is one of the important parameter that best represents soft tissue profile of maxilla.[24] Burstone suggested that nasolabial angle represents inclination of maxillary anterior teeth. He stated that when angle is increased it indicates retroclined maxillary anterior teeth, and proclination of maxillary teeth when angle is decreased.[25] Mean value of nasolabial angle in this study is parallel to another study which was conducted in Khyber Pakhtunkhwa province of Pakistan by Raza et al[5] (105.8º + 3.95). It also correlates with the values reported by Fitzgerald et al[26] (114.08º ± 9.58º); McNamara Jr JA[12] (102º), Owen et al[27] (105º±8º). Literature review showed that the value of the nasolabial angle related to harmonious faces varies considerably. Mean value of nasolabial angle in this study was found

to be slightly higher than that reported for Indian population is (96.1º ± 9.7º). 28 It was also found to be higher than those reported by Rehan et al[29] (99.9º ± 10.6º) and Hameed et al[30] (99.4º ± 12.2º), who also conducted similar type of study but in different provinces of Pakistan. These variations in results can be due to different ethnic background of the patients.

Profile of the patient can be affected by many factors like thickness and tonicity of the lips, thickness of the chin, inclination of anterior teeth and underlying skeletal pattern.[31] Nasolabial angle is constructed by two lines, one from the upper lip and other from the nose, independent of each other. Only measuring nasolabial angle provides insufficient information, as angle formed by these two lines results from their individual inclinations and does not show which component to blame. This variability can be due to the nose, lip or both. The concept of having balanced relationship between nose, lip and chin is not new. It goes back to 1950's when Dr Robert Ricketts was concerned that many orthodontists, in the name of occlusion and alignment, were actually making esthetic appearance of patient worse by not paying attention to what he called Esthetic Line (E-Line). E-Line is line drawn from the tip of the nose to the tip of the chin. His key evaluation was to look at the distance of upper and lower lips in relation to E-Line. He suggested that to have a balanced profile in average Caucasian face upper lip should be 4 mm behind E-Line and lower lip should be 2 mm behind the ELine.9 Results of this study showed that both upper and lower lips were slightly protrusive with reference to the E-Line norms proposed by Ricketts. Distance from E-Line to upper lip was 2.91 ± 2.45 mm while to lower lip it was found to be 1.25 ± 2.67 mm. Rehan et al 29 reported that mean value of E- Line to upper and lower lips was -3.2 ± 3.13 mm and -1.5 ± 2.8 mm respectively. Hameed et al30 reported that anterio-posterior position of upper and lower lips in relation to E-Line was –1.53 ± 3.98 mm and 0.87 ± 3.39 mm respectively. Asad et al 32 reported that mean value of E-Line to upper lip was -1.9 + 3.33 mm and that of the lower lip was found to be -0.4 + 3.24 mm.

Steiner introduced S-Line suggesting that Ricketts E-Line is influenced by nose length. He proposed that in well balanced average Caucasians face distance of upper and lower lip to S Line is 0+2 mm. Results of current study suggest that with reference to S-Line, both upper and lower lips lies close to the norms proposed by the Steiner. Distance from S-Line to upper lip was 0.0 ± 2.5 mm while to lower lip it was found to be - 0.71 ± 2.5 mm. A study conducted by Erbay et al 33 among Turkish adults reported that both the upper and lower lips were lying behind the S-Line norms. While various other studies conducted locally and around the globe reported that both the upper and lower lips were lying ahead of S-Line norms proposed by Steiner.[32,34-35]

CONCLUSION

In modern orthodontics, a comprehensive soft tissue assessment not only holds significance in orthodontic diagnosis and treatment planning but is also valuable in determining treatment outcome and stability. In this sample of Karachi population nasolabial angle was found to be in agreement with majority of various studies conducted around the globe. Upper and lower lips were found to be prominent with reference to E-Plane norms proposed by Ricketts. However both lips were found to be very close to S-Line norms proposed by Steiner's. Results of this study, conducted in a sample of Karachi population only, do not necessarily reflect the trend of entire Pakistani population as soft tissue appearance of one ethnic group varies from the other.

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