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EFFECT OF MAXILLARY INCISOR INCLINATION AND ANTEROPOSTERIOR POSITION OF MAXILLA ON NASOLABIAL ANGLE

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ABSTRACT:

Objective: To evaluate the effect of upper incisor inclination and anteroposterior maxillary position on nasolabial angle (NLA) and it's lower compartment (LNLA).
Study Design: Cross sectional descriptive study
Material and Methods: Pre-treatment lateral cephalometric radiographs of 50 patients visiting orthodontic department of Isra dental college, Isra University Hyderabad l from Jan 2016 to July 2016 were traced. NLA, LNLA, maxillary incisor to S-N plane (UISN) and SNA were drawn and Correlation was evaluated using Pearson correlation coefficient (r). A p value of less than 0.05 was considered to be statistically significant.
Results: Out of 50 patients, 10 were males and 40 were females. Patients ranged in age from 9- 13 years. According to skeletal base classification, 22 patients were from class I, 27 were from class II and only 1 patient belonged to skeletal base class III.
The UISN of patients ranged from 77° to 129° with a mean of 109.26° and the SNA ranged from 74° - 94° with a mean of 82.16°. The NLA ranged from 60° - 124° with a mean of 92.64°. The LNLA ranged from 45° -106° with a mean of 70.58°.
Pearson correlation test showed that SNA and UISN have a negative and week correlation with NLA and LNA.
Conclusions: There is a negative and statistically insignificant correlation of upper incisor inclination and anteroposterior maxillary position with nasolabial angle (NLA) and lower compartment of nasolabial angle (LNLA).
Keywords: Maxillary Incisor inclination, Anteroposterior maxillary position, Nasolabial angle, Correlation.

INTRODUCTION:

With the advent of soft tissue paradigm, ideal facial soft tissue proportions have been the main focus in orthodontics. [1] A major orthodontic treatment goal is to improve occlusion and facial aesthetics. Hence, currently evaluation of facial soft tissues is an integral part of orthodontic diagnosis and treatment planning. [2]

Several parameters have been used to evaluate facial soft tissue in profile view. Nasolabial angle (NLA) is one of the important parameters that affect the facial aesthetic and therefore orthodontic treatment planning especially regarding extraction and non-extraction decision.[3] It is formed by a tangent to the lower border of columella of the nose and a tangent to upper lip. [3] The normal range of nasolabial angle is 102 ± 8°. [4, 5]

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The two main components of nasolabial angle (NLA) are the upper and the lower compartments. The upper compartment depends on the inclination of columella of the nose, whereas the lower compartment is influenced by lip thickness, lip strain as well as underlying dento-skeletal hard tissue structures. [6]

Various studies have found a significant correlation between protrusion and retrusion of jaws and inclination of teeth with nasolabial angle (NLA). [7, 8, 9] Whereas others have found no significant correlation between the underlying dento-skeletal hard tissue structures and nasolabial angle (NLA). [10, 11, 12]

So, the aim of this study is to evaluate the effect of maxillary incisor inclination and anteroposterior position of maxilla on nasolabial angle (NLA) and its lower compartment (LNLA).

Maxillary incisor inclination is measured by using Steiner's analysis by drawing the long axis of upper central incisor and measuring it's inclination while keeping SN plane (a line between Sella and Nasion) as a reference plane. The norm of UI-SN Plane angle is 102 ± 5°.

The anteroposterior position of maxilla was also identified using Steiner's analysis (SNA), an angle between SN plane and a line joining Nasion to point A. The norm of SNA is 82 ± 2°.[13]

MATERIALS AND METHODS:

This cross-sectional descriptive study was conducted on 50 patients who visited orthodontic department of Isra dental college, Isra University Hyderabad in the duration of 6 months from Jan 2016 to July 2016.

Patient's age and gender were noted. Clear and sharp pre-treatment lateral cephalometric radiographs were taken with teeth in occlusion and lips in relaxed position. Pre-treatment patients, patients without missing or impacted anterior teeth and cephalometric radiographs with clear and obvious landmarks of all classes were chosen in inclusion criteria whereas patients having cleft lip and palate, severe sagittal and vertical discrepancies, missing or supernumerary anterior teeth affecting the nasolabial angle or upper incisor inclination and vague or unclear radiographs were excluded from the sample as a part of exclusion criteria.

Each cephalometric radiograph was traced by S.M and re-evaluated by second examiner H.N to remove any tracing or landmark identification error. A matte acetate tracing paper of 8×10 inches area and 0.003 inch thick was used to trace the radiographs.[14] Important landmarks were drawn and required angles were measured. Nasolabial angle was taken by drawing a line tangent to the lower border of the nose and the upper lip from base of the nose to the tip of the nose. Nasolabial angle was further divided into upper and lower compartment by drawing a true horizontal line LNLA was measured

between the true horizontal line and a line tangent to the upper lip. Incisor inclination was measured by using the angle UISN by drawing the long axis of upper central incisor and the SN plane (a line between Sella and Nasion).

The anteroposterior maxillary position was identified by SNA, an angle between SN plane and a line joining nasion to point A. The norms of SNA are 82°, measurements above this were considered as prognathic maxilla or maxillary excess and measurements less than this were considered as retrognathic maxilla or maxillary deficiency. [13]

Skeletal base classification was also noted using Steiner's analysis. Patients with ANB ranging from 0-4° were considered as skeletal base class I, and patients with ANB greater than 4° were considered as skeletal base class II whereas patients who had ANB in negative values that is lesser than 0° were considered as skeletal base class III.

SN plane was taken as reference plane while measuring UISN and SNA angles. According to Steiner this plane remains true or shows only a minimal deviation when the head is rotated or deviated away from the correct profile position. [15]

Scheideman et al. [16] drew a postural horizontal line through Sn which further divided the nasolabial angle into 2 compartments, upper and lower. They debated that each of these angles should be evaluated separately.

The data was collected and analysed using SPSS version 21. Frequencies were found for all variables and bivariate correlation analysis was performed using Pearson test to find the effect Upper Incisor inclination (UISN) on Nasolabial angle and lower compartment of Nasolabial Angle. The same test was also used to find the effect maxillary anteroposterior position (SNA) on Nasolabial angle (NLA) and lower compartment of Nasolabial Angle (LNLA). The significance value was set < 0.05.

RESUTS:

Total 50 patients were included in the study, of which 10 were males (20 %) and 40 were females (80 %). Figure 1

Patients ranged in age from 9- 13 years with the mean age of 20.08 and standard deviation of 5.241 (Table 1). According to skeletal base classification, 22 patients (44 %) were from class I, 27 (54%) patients were from class II and only 1 patient (2 %) belonged to skeletal base class III. Figure 2

In our study the UISN of patients ranged from 77° to 129° with the mean value 109.26° and standard deviation of 10.69°. The SNA of our patients ranged from 74° -94° with the mean value 82.16° and standard deviation of 4.469°. The NLA of our patients ranged from 60° - 124° with the mean value 92.64°and standard deviation of 14.314°. The LNLA of our patients ranged from 45° -106° with the mean value 70.58° and standard deviation of 12.214 °. Table 1

According to the results shown by Pearson correlation test, there is a negative correlation between SNA and NLA and LNA i.e. when SNA increases NLA and LNLA decreases and vice versa. The UISN also had negative correlation with NLA and LNLA. But both these negative correlations were statistically insignificant. Table 2

DISCUSSION:

Soft tissue profile examination is an important step of orthodontic diagnosis and treatment planning. Since, orthodontic treatment variably affects soft tissue profile of an individual, so careful examination of soft tissue profile is mandatory before treatment planning. [17-33]

In this study we evaluated the relationship between upper incisor inclination and anteroposterior maxillary position on nasolabial angle (NLA) and its lower compartment (LNLA). Since, it is believed that NLA is an important parameter while deciding treatment plan for a patient especially extraction/ non-extraction decisions. First premolar extraction can be undertaken in cases of acute NLA and should be avoided if NLA is obtuse.

A true horizontal line is used in this study to divide the nasolabial angle (NLA) into an upper compartment (UNLA) and a lower compartment (LNLA) because nasolabial angle (NLA) is formed by drawing a line tangent to the upper lip and to the lower border of nose so its values are affected by the position of both nose and lip.[13] Therefore, to eliminate this effect in order to identify the changes in nasolabial angle individually due to lip position LNLA was also measured in this study.

This study was designed to evaluate the correlation of anteroposterior maxillary position and incisor inclination with nasolabial angle (NLA) and its lower compartment (LNLA). As the hard tissues lay below the soft tissues so the position of lip and thus the value of NLA seems to be affected by the anteroposterior position of underlying maxilla and upper incisor inclination.

Total 50 patients were included in the study, of which 10 were males and 40 were females**.** The patients were divided into three groups according to the skeletal base classification: 22 patients were from class I, 27 patients were from class II and only 1 patient belonged to skeletal base class III.

Steiner's analysis was used to determine the anteroposterior maxillary position and inclination of upper incisors and then compared with NLA and LNLA.

According to Angle ideal occlusion was important and he suggested that if the dentition was intact, soft tissues would take a pleasant position, while Tweed assumed that it would be more stable aesthetic if the mandibular incisors were kept upright over the basal bone so he suggested hard tissues to be used for diagnosis and treatment planning of orthodontic patients. [34] Reidel proposed that splendour was the eventual goal of

orthodontic treatment so ideal form, function and aesthetics should be achieved at the end of orthodontic treatment. [35]

According to the results of our study, there is a negative and weak correlation between UISN and NLA (r=-.228) and LNA (r=-.201) i.e. when UISN increases NLA and LNLA decreases and when UISN decreases NLA and LNLA increases but this correlation was statistically insignificant with p value of correlation between UISN and NLA is 0.112 and in correlation between UISN and LNA p value= 0.162.

The result of this study accord with the study carried out by Jan A et al. [36] in 2014 which stated that UISN and NLA were negatively and weakly correlated to each other.

According to Fitzgerald et al patients having proclined maxillary incisors might have NLA ranging in normal values so he declared that variations in soft tissue cannot be described by NLA. [8]

While evaluating profile changes before treatment, at the end and 4 years after of treatment with or without premolar extraction Erdinc et al[37] found that correlation between hard and soft tissue variables was not clinically significant.

Gandhi et al[38] found in his study that upper incisor inclination (UISN) and lower compartment of nasolabial angle (LNLA) had no significant correlation.

According to some other studies proposed by Seben et al[39], Ramos et al [9] and Talass et al[7] upper incisor inclination has significant effect on NLA. They observed that retraction of upper incisors increased the nasolabial angle (NLA).

Saxby [40] and Freer found in their study that upper incisor inclination and anteroposterior position of maxilla may affect the lip position but they didn't try to find a clinical statistical correlation.

Lo [41] and Hunter performed a serial cephalometric study on Class II, Division I malocclusion patients of whom fifty subjects were orthodontically treated while forty-three subjects were untreated. Quantitative study on soft tissue profile of these patients was carried out using their series of cephalometric radiographs. To evaluate the changes in the values of nasolabial angle due to upper incisor retraction, several analysis were used including correlation tests, multifactorial analysis and regression analysis of variance. Growth had no significant influence on the changes in nasolabial angle but it was observed that maxillary incisor retraction had significant effect on the changes in nasolabial angle and they were directly proportional to each other. As the incisors were retracted the NLA also increased accordingly.

In this Era most of the studies evaluated the correlation between maxillary incisor inclination and nasolabial angle and there are only fewer studies regarding

correlation between anteroposterior position of maxilla and nasolabial angle so this study was also designed to evaluate the correlation of anteroposterior maxillary position and nasolabial angle (NLA) and its lower compartment (LNLA). The results of this study showed that there is a negative and weak correlation between SNA and NLA (r= -0.186) and LNA (r= -0.165) i.e. when SNA increases NLA and LNLA decreases and when SNA decreases NLA and LNLA increases but this correlation was statistically insignificant.

In a study conducted by Jensen et al, he found that jaw surgery had little impact on soft tissue changes as compared to incisor movement which is (60-70%). [10]

Louis et al found that hard to soft tissue proportion changed when maxilla was advanced with vertical control in jaw movement. But he noticed that NLA did not change significantly. [11]

Vasaudan et al found in his study that upper lip moved forward with Lefort I maxillary advancement. [12]

So it seems lip position might depend on several morphologic factors and growth and changes in lip position are variable. [37]

According to another study, there is no statistically significant correlation between NLA and LNLA and anteroposterior maxillary position and skeletal relationship. [42]

However, correlation between maxillary position and NLA could alter because of dental compensation which occurs in skeletal problems. So, this study was designed to evaluate correlation of anteroposterior maxillary position and incisor inclination on NLA and its lower compartment. Further studies are still required on NLA and its correlation with variables which alter it.

CONCLUSION:

There is a negative and statistically insignificant correlation of maxillary incisor inclination and anteroposterior position of maxilla with nasolabial angle (NLA) and lower compartment of nasolabial angle (LNLA).

An orthodontist must also consider other parameters like lip thickness and strain while undertaking extraction/ non-extraction decisions for orthodontic patients.

In order to evaluate a more reliable relationship of nasolabial angle with anteroposterior maxillary position and upper incisor inclination, further studies are still needed to be conducted.

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TABLES AND FIGURES:

Table 1: Frequencies of age, SNA, UISN, NLA, LNA

	Age	SNA	UISN	NLA	LNLA
Mean	20.08	82.16	109.26	92.64	70.58
Std. Deviation	5.241	4.469	10.690	14.314	12.214
Minimum	9	74	77	60	45
Maximum	30	94	129	124	106

Table 2: Pearson correlation test

		NLA	LNLA
SNA	Pearson Correlation	-.186	-.165
	P-value	.196	.253
	N	50	50
UISN	Pearson Correlation	-.228	-.201
	P-value	.112	.162
	N	50	50

Figure 1: Distribution of study sample according to gender

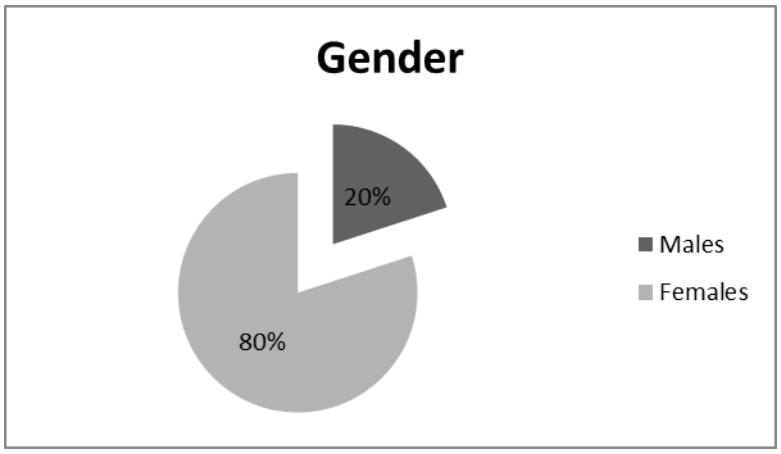

Figure 2: Distribution According To Skeletal Base Classification