NASAL MORPHOLOGY AS AN INDICATOR OF VERTICAL MAXILLARY SKELETAL PATTERN IN PAKISTANI POPULATION

Ayesha Iftikhar[1], Sohrab Shaheed[1], Ulfat Bashir[2]

[1] Department of Orthodontics, Rehman College of Dentistry. Peshawar

[2] Department of Orthodontics, Islamic International Dental College, Riphah International University, Islamabad.

Abstract

Objectives: *This study was conducted to determine the relationship of soft tissue nasal parameters with the vertical skeletal parameters.*

Materials & Methods: *The sample included the lateral cephalometric radiographs of 138 patients. The lateral Cephalograms were imported and analyzed using Viewbox 4Software. Patients with no previous history of trauma, surgical intervention, congenital disease or orthodontic treatment were included in the study. Six skeletal parameters of vertical facial growth and six nasal parameters were measured.*

Results: *The nasal parameters showed a weak correlation with the vertical skeletal parameters. Nasal length showed strong correlation with the facial heights; anterior as well as posterior i.e. S-Go(r=0.747), N-Me(r=0.865), N- ANS(r=0.862), LAFH(r=0.776),p<0.005 respectively. Nasal depth showed the similar results i.e. S -Go(r=0.691), N-Me(r=0.733), N ANS(r=0.733), LAFH(r=0.660),p<0.005 respectively. The upturn of the nose was not found to be correlated to the inclination of the palatal plane (r=-0.108), P=0.666.*

Conclusion: *Nasal length and depth were found to be strongly correlated with facial height. All the rest of the variables were poorly correlated with skeletal parameters.*

Key Words: *Nasolabial angle, upturned nose, the inclination of the palatal plane*

Introduction

The nose is an important part of the soft tissue profiles it dominates the midface. Nose defines the facial appearance in close harmony with the chin and lips,[1,2]. Orthodontistsshould not only have a thorough knowledge of the relationship between these structures but also the growth of these structures that takes place to achieve the desired orthodontic and surgical treatment goals[3].

Nasal features vary from race to race along with other facial characteristics[4,5].

Correspondence:
Ayesha Iftikhar
Assistant Professor
Department of Orthodontics, Rehman College of Dentistry. Peshawar.
Cell # +92-300-855 4719
E-mail: ayesha.iftikhar@rmi.edu.pk

Nasal growth has been reported to occur till the age 16 in girls and 18 in boys. Vertical growth of the maxilla continues even after the completion of growth in sagittal and transverse planes[3,6]. Also, nasal cartilaginous septum derived from chondrocranium, is thought to be responsible for this vertical growth. Any aberrancy in the growing pattern pre/postnatally affects the maxillary growth[7-9].

Nasolabial angle (definition)has remained a subject of interest by the orthodontists as a close relationship exists between the upper lip and the nose. Acuteness or obtuseness of the nasolabial angle is related to the maxillary base.[10]

Nasolabial angle has been divided into two components lower nasolabial angle (UNLA) upper lip inclination, upper nasolabial angle (LNLA) upward nasal tip inclination.3There have been conflicting reports regarding the relationship UNLA with the

palatal plane[11]. A recent study suggested a negative correlation of UNLA with the palatal plane in an Indian sample.

On the other hand, in another study, no such correlation was found[3].

This study was aimed to investigate the correlation between the nasal morphology and vertical skeletal parameters. The null hypothesis for the study was that no relationship existed between the nasal morphology and vertical skeletal parameters and palatal plane.

Materials and Methods

Ethical committee approval for the study was obtained from Islamic international dental hospital, Islamabad. The pretreatment lateral cephalograms of 138 patients were selected who underwent orthodontic treatment at the Department of Orthodontics, Islamic International Dental Hospital. Cases with no prior orthodontic treatment, no congenital anomaly or the history of prior orthodontic intervention were included. The lateral cephalograms were imported to and analyzedusingViewbox four software. (Figure 1) Six vertical skeletal, six nasal soft tissue parameters and nasal landmarks were used for analysis (see Table 1)[3].

Pearson's correlation coefficients were used to determine the correlation of the nasal parameters with the vertical skeletal parameters. Nasal parameters were also evaluated similarly. All calculations and analyses were performed with Statistical Package for Social Sciences (SPSS v.16). An r value of 0.75 or more was considered a strong correlation.

Results

Table 2 shows the descriptive data of the vertical skeletal and the soft tissue nasal parameters. Correlation and significance between nasal and the facial skeletal parameters are listed in Table.3 Correlations and significance among the nasal parameters are shown in Table 4.

Nasal Length (NLTH)showed highly positive and significant correlation with anterior facial height (r=0.865),upper facial height (r=0.862), posterior facial height (r= 0.747) and lower facial height(r= 0.776). High significant positive correlation was shown with nasal depth (r=0.740).

Nasal Depth (NDPT)had a significantly high positive correlation with anterior facial heights (r=0.733), posterior facial height (r= 0.691), lower facial height (r=0.660) and Upper facial height (r=0.733) . Significant high positive correlation was shown by nasal length (r=.0740) only.

Nasolabial angle (NLA) Showed a weak and insignificant correlation with all the skeletal parameters. A significant positive correlation was shown with lip inclination (r=0.816) and moderate significant positive correlation with nasal tip angle and nasal upward tip inclination(r=0.539 and r=0.543) respectively.

Nasal upward tip angle (UNLA)showed a significant high positive correlation with Nasal tip angle (r= 0.818) and moderately significant positive correlation with a nasolabial angle (r=0.543).

Lip inclination (LNLA) showed insignificant and weak correlations with all the skeletal parameters. Highly positively correlation was shown with a nasolabial angle (r=0.816) only.

Nasal tip angle(NTP) showed significant high positive correlation was shown with an upward nasal tip angle (r=0.818) and moderate positive and significant

correlation with Nasolabial angle (r=0.539).

Discussion

Besides obtaining better dentition and function, the improvement of the facial esthetics is the key objective of any successful orthodontic treatment. As the orthodontic treatment paradigm has shifted from hard to soft tissues in the recent past years, the profile of the patient has gained great attention[2-5]. Nose Dominates the midface and has been considered an important part of the soft tissue profile. Nasal morphology varies from patient to patient and should be assessed accordingly during orthodontic planning and treatment to achieve better treatment outcomes besides other parameters[11-13]. Nasolabial angle assessment is an important part of the soft tissue profile as it reflects the maxillary dentition. Lo and Hunter were the first ones to describe the Nasolabial angle into two parts[11].

Like previous studies, the nasolabial angle showed a weak correlation with the skeletal parameters, but with the UNLA, LNLA and NTP correlations were positively strong.

Fig: 1 Viewbox 4

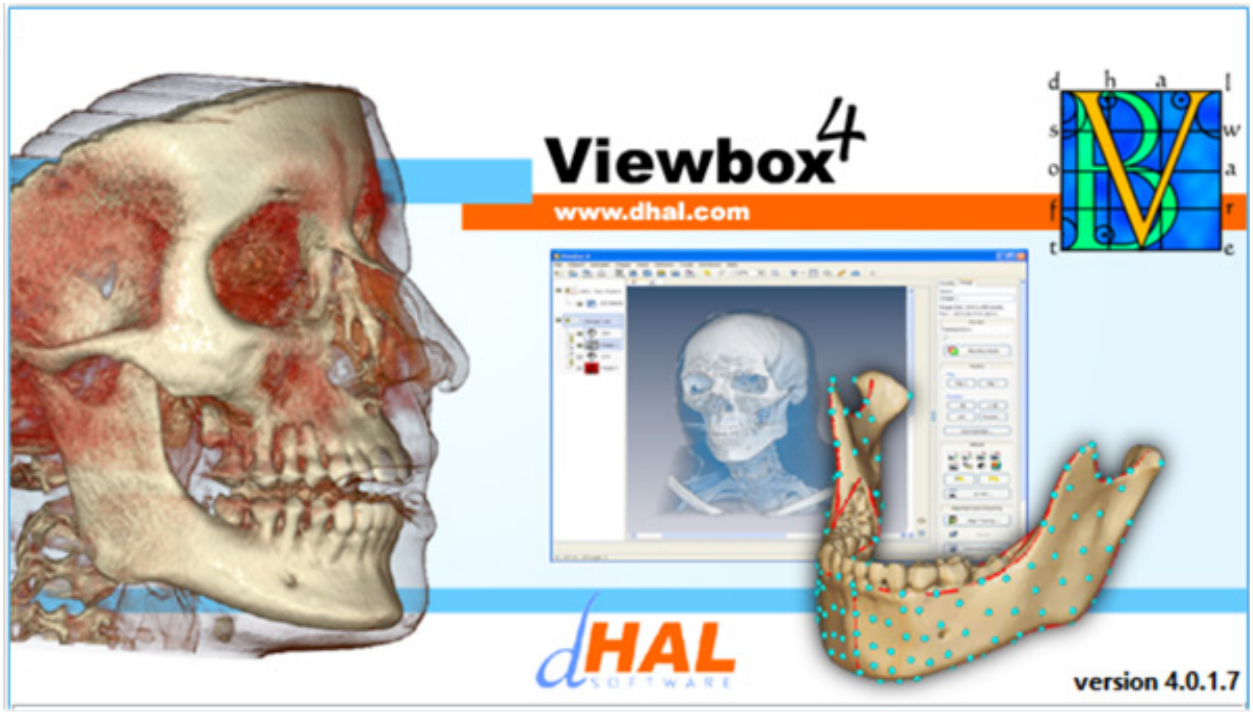

Table 1: Skeletal vertical , soft tissue nasal landmarks and nasal Parameters

Skeletal Vertical Parameters	Soft tissue Nasal landmarks	Nasal Parameters
1. GoGn-SN: the mandibular plane inclination to the cranium	1. Soft tissue nasion (N'): the point of greatest concavity in the midline between the forehead and the nose;	1. Nasal length (NLTH): the distance between N' and Pr;
2. S-Go: Posterior facial height;	2. Pronasale (Pr): the tip of the nose (nasal tip);	2. Nasal depth (NDPT): the perpendicular distance between Pr and the line drawn through N' to Sn;
3. N-Me: Anterior facial height;	3. Subnasale (Sn): the deepest point at which the columella merges with the upper lip in the midsagittal plane;	3. Nasolabial angle (NLA): the angle formed by the intersection of the Sn tangent (a tangent drawn from Sn along the lower border of the nose at the approximate middle third) and the Ls line;
4. N-ANS: anterior maxillary height;	4. Labrale superius (Ls): the point indicating the mucocutaneous border of the upper lip.	4. Nasal upward tip angle (UNLA): the posteroinferior angle formed when Sn tangent is extended anteriorly to intersect the Frankfurt horizontal plane/ lower border of the nose to Frankfurt horizontal plane;
5. ANS-Me: Lower Anterior Facial Height		5. Upper lip inclination (LNLA): the antero-inferior angle formed by the Sn -Ls line extended superiorly to intersect the Frankfurt horizontal plane/ inclination of upper lip to Frankfurt horizontal plane;
6. SN-PP: The angle between the Sella - Nasion plane and the ANS-PNS line (inclination of palatal plane)		6. Nasal tip angle (NTP): the angle formed by the axis of the dorsum and Sn tangent.

Table 2: Mean values and standard deviation for nasal and skeletal parameters

Cephalometric parameters	Mean	SD
GoGnSn	32.5	6.9
S-Go	81.6	12.8
N-Me	126.4	19.6
N-ANS	56.9	9.2
LAFH	72.2	12.2
SN-PP	8.50	3.5
AOI	87.1	4.3
N Lth	54.2	9.0
N Dpt	18.2	3.3
NLA	102.0	13.5
LNLA	84.1	11.4
UNLA	17.9	7.8
NTP	77.7	8.08

Table 3: Correlation and significance of nasal parameters with vertical facial skeletal parameters

	NTP	LNLA	UNLA	NLA	NDPT	NLTH
GoGnSn	0.004	0.011	-0.0149	-0.078	0.030	0.121
S-Go	-0.054	0.062	-0.070	0.011	0.691*	0.747*
N-Me	-0.039	0.023	-0.168*	-0.078	0.733*	0.865*
N-ANS	-0.078	0.064	-0.168*	-0.044	0.733*	0.862*
LAFH	-0.015	0.004	-0.157	-0.088	0.660*	0.776*
SN-PP	-0.097	0.119	-0.108	0.037	0.119*	0.128*
AOI	0.044	-0.100	0.174*	0.016	-0.085	-0.238*

Pvalue< 0.05 *

Table 4: Correlation and significance with nasal Parameters

	NTP	LNLA	UNLA	NLA	NDPT	NLTH
NTP	1	0.078	0.818*	0.539*	-0.271*	-0.072
LNLA	0.078	1	-0.043	0.816*	0.205*	0.162*
UNLA	0.818*	-0.043	1	0.543*	-0.312*	-0.272*
NLA	0.539*	0.816*	0.543*	1	-0.009	-0.022
NDPT	-0.271*	0.205*	-0.312*	-0.009	1	0.740*
NLTH	-0.072	0.162	-0.272	-0.022	0.740*	1

P-value< 0.05 *

Several studies have been conducted in the past years to relate the nasal parameters with the sagittal and vertical soft tissue parameters. Studies regarding determining the relationship between the nasal and skeletal parameters in the literature are very few[14].

Our study depicted most of the correlations as weak among the skeletal and nasal parameters. Only nasal length and depth showed a strong correlation with the facial heights both anterior and posterior. Our results were generally in accordancewithNehraetal3 who conducted their study on Indian population, but their correlation on nasal length and depth were moderate in contrast to our study. Nasal length in our study showed the highest correlation with the anterior facial height. While their study showed the highest correlation with upper facial height N-ANS[3]. It was, therefore, revealed that the nasal characteristics are related to the facial type as depicted by Enlow and

Hans et al[15]. Leptoprosopic faces had more protrusive and tipped down, and that of euryprosopic have a straighter and a more tipped up nose.

Nasal depth in our study showed a strong correlation with the facial heights anterior and posterior, in contrast to Gulsen et al[16]. who reported revealed a moderate correlation of nasal depth with facial heights both anterior and posterior.

Nehra et al[3] reported a strong correlation between UNLA and skeletal parameters and a negative correlation with the palatal plane inclination showing that nose gets more upturned as the maxilla rotates anticlockwise decreasing the facial height.3Contrary to our study these results correlations were very weak. Therefore, the results of our study, in general, do not support the theory of Scott and Latham who hypothesized a strong correlation between nasal morphology and maxillary growth[17,18].

We noticed a weak correlation of the maxillary skeletal framework with the nasal parameters. Like other studies conducted on different populations, our study failed to determine that the upturn of the nose was related to the inclination of the palatal plane and rotation of the maxilla.

Further studies can be done on different ethnic populations and with larger sample size to get a better picture of the association.

Conclusion

1. Soft tissue nasal and the skeletal vertical parameters were weakly correlated with each other.
2. Only nasal length and depth were found to be strongly correlated with the facial heights both anterior and posterior.
3. The nasal upturn was weakly correlated with the anticlockwise rotation of the maxilla.

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