The relation of the maxillary central incisor, nasal bone, anterior cranial base lengths and the body height in different skeletal patterns

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ABSTRACT

Background: The reason for measuring the frontonasal field which include the length of the anterior cranial base , the nasal bone, and the incisors is that all these structures deviate from normal structures in patients with malformations of the frontonasal field.

Materials and Methods: Maxillary central incisor, nasal bone and anterior cranial base lengths were measured by cephalometric analysis of 122 lateral cephalometric radiographs using autocad 2008 program, also body height was assessed by height measuring standard for adult patients with different skeletal patterns, including CLI (n= 48), CLII (n= 45), CLIII (n= 29), normal MP-SN angle (n= 70), low angle (n= 28) and high angle (n= 24) .

Results and Conclusion: The maxillary central incisor was longer in high angle males group c. Short nasal bone was found in CLII males and females and in low angle males group. Longer anterior cranial base was found in low angle males, while the anterior cranial base was shorter in high angle males.

Key words: Cephalometrics, Maxillary central incisor, Nasal bone, anterior cranial base, Body height. (J Bagh Coll Dentistry 2011;23(1):112-115).

INTRODUCTION

The frontonasal field is a fan shape, axially orientated, field anterior of the cranial base, involved in its formation are neural crest cells from the junction between the neural plate and the surface ectoderm. These cells form the external and internal nose and the anterior part of the maxilla after migration from the neural crest to the area between the eyes and to the premaxillary area where they interact with the local ectoderm. They also form the dentin and pulp tissue in the incisor region. Roughly, the frontonasal field forms the lower part of the frontal bone, the external and internal nose, the four maxillary incisors with surrounding alveolar bone and soft tissue. The field is limited posterior by the sella turcica [1]. The reason for measuring the frontonasal field which include the length of the anterior cranial fossa , the nasal bone, and the incisors is that all these structures deviate from normal structures in patients with malformations of the frontonasal field, examples of such malformations are SMMCI (single median maxillary central incisor) and cleft lip/or and palate . Studies of these malformations have documented that the nasal bone and the anterior cranial base are short in SMMCI [2- 4] and in cleft lip [5]. In both conditions, malformations occur in the upper incisor region.

So due to the above reason and because there is no previous Iraqi study about the relation ship between the components of the frontonasal field and height of the body this study has been conducted.

MATERIALS AND METHODS

The sample includes patients attending the Orthodontic department of college of Dentistry, university of Baghdad, in addition to under and postgraduate students in the same college. The age ranged between 18-25 years. Out of 375 subject examined, only 186 subjects met the inclusion criteria and from those only 122 radiograph (62 males and 60 females) analyzed and the others had been neglected either due to inaccurate radiography or in accurate patient position .The radiographs were analyzed to obtain the ANB and MP-SN angles to divide the sample into three sagittal and three vertical skeletal groups as following:.

According to ANB angle, the sample was classified into three sagittal skeletal classes as shown in table 1 :

Table 1: Sample classification according to ANB angle

Class	ANB	Subjects number	males	females
CLI	2˚- 4˚	48	23	25
CLII	> 4˚	45	22	23
CLIII	< 2˚	29	17	12
Total		122	62	60

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The same sample was classified according to MP-SN angle into three vertical skeletal groups as shown in table 2:

Table 2 sample classification according to MP-SN angle

Group	MP-SN	Subjects number	males	females
Normal angle	30°-40°	70	32	38
Low angle	< 30°	28	16	12
High angle	> 40°	24	14	10
Total		122	62	60

Clinical examination

Each patient was examined extraorally for any sever deviation in the nose or facial anomalies, and intraorally the maxillary central incisor was examined for any fracture , CLIV or large palatal filling , crown, bridge , anomalies , mobility , periodontitis , pocket especially deep ones which may reach the tooth apex as in perio-endo lesion .Any central incisor with large palatal filling or periodontitis or pocket or mobility was radioghed by taking periapical x-ray film to find if there was a previous root canal treatment or apicoectomy or resorption of root apex to exclude this patient from the sample.

Assessment of body height

According to Tanner and Whitehouse [6] and Raiq [7] Subject's height should be taken without shoes, with his/her heels and back in contact with an upright wall , and he looks straight forward with the lower border of the eye sockets in the same horizontal plane as the external auditory meati . The right – angled head piece block of the height measuring standard is then slide down the wall until its bottom surface touches the subject's head, and then the scale is read.

Cephalometric Analysis

Every lateral cephalometric radiograph was analyzed by AutoCAD program 2008 to calculate angular and linear measurements .The angles measured directly while the linear measurements were divided by scale for each picture to overcome the magnification factor as shown in figure 1

Three variables measured to describe the frontonasal area were expressed as the distance in millimeters. The length of the maxillary central incisor was measured as the distance from the tooth's incisal edge (is) to the tip of its apex (ap) [8]. The length of the nasal bone was measured as the distance from the most anterior point on the nasal bone (na) to the nasion (n) [9] . The length of the anterior cranial base was measured using the nasion (n) and sella (s) reference points [8] .

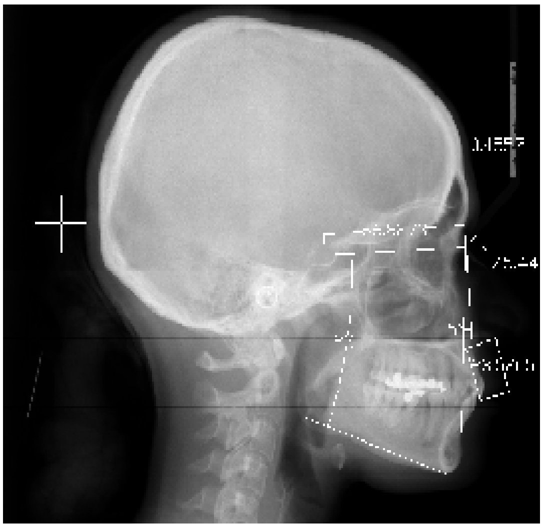

Figure 1: Cephalometric measurements

Statistical Analysis

All the data of the sample were subjected to computerized statistical analysis using SPSS version 15 (2006) computer program. The statistical analysis included:

1. Descriptive Statistics

• Mean.
• Standard deviation (SD).
• Minimum and maximum values.
• Statistical tables.

2.Inferential Statistics

● Paired t-test: for intra-examiner and inter-examiner calibration.
● Pooled t-test: for the comparison between both genders.
● One way ANOVA: to compare the length of maxillary central incisor, nasal bone , anterior cranial base ,and body height in different sagittal and vertical groups.
● Least significant difference (LSD) test: after ANOVA test to detect significance of difference between every two groups.
● Pearson's correlation coefficient to find the correlation between the different variables in different anteroposterior and vertical relations.

RESULTS

There was a significant genders difference in the length of maxillary central incisor in all anteroposterior and vertical skeletal groups and it was longer in males (table 1) .Also the maxillary central incisor was longer in high angle males group (table 2) . While there is a significant gender difference in the length of the nasal bone in CLII, CLIII and normal angle groups, and the nasal bone was longer in males. Also shorter nasal bone was found in CLII males and females and in low angle males (table 3). There was a significant gender difference in the length of anterior cranial base in all anteroposterior, normal, and low angle skeletal groups. Also the anterior cranial base was longer in low angle males, and it was shorter in high angle males. There was a significant genders difference in tle body height in all anteroposterior and vertical skeletal groups , and males was taller than females while there was no significant difference in the body height in all anteroposterior and vertical skeletal groups.

Table 1 Descriptive statistics and Genders differences

Variables	Total sample (n=45)				Males (n=22)				Females (n=23)				Genders Difference d.f. = 108	
	Min.	Max	Mean	SD	Min	Max.	Mean	SD	Min.	Max.	Mean	SD	t-test	Sig.
ANB	5	13	6.51	1.80	5	10	6.81	1.70	5	13	6.21	1.88	1.12	0.269 NS
SN	61.98	76.01	67.60	3.47	64.17	76.01	69.71	3.24	61.98	70.97	65.57	2.31	4.949	0.000 ***
NB	13.59	30.29	21.9	3.54	16.88	30.29	23.18	3.39	13.59	26.31	20.88	3.31	2.3	0.026 *
CI	19.21	30.62	24.14	2.46	22.72	30.62	25.80	1.95	19.21	26.77	22.56	1.78	0.64	0.000 ***
MPSN	19	50	35.8	6.95	26	49	37.31	7.03	19	50	34.34	6.71	1.449	0.155 NS
L	146.8	191	166.3	10.12	157.5	191	173.6	7.55	146.8	172	159.4	6.81	6.653	0.000 ***

Table 2 LSD test between every two significant groups for males(vertical)

Variables	Normal angle-low angle		Normal angle-high angle		Low angle-high angle	
	Mean difference	P-value	Mean difference	P-value	Mean difference	P-value
SN	-1.83	.034 *	2.062	.027 *	3.899	0.000 ***
NBL	3.246	.003 **	-.857	.444	-4.103	0.002 **
CI	-1.212	.054	-1.633	.016 *	-0.42	0.577

Table 3 LSD test between every two significant groups for males(anteroposterior)

Variables	Class I- Class II		Class I- Class III		Class II- Class III	
	Mean difference	P-value	Mean difference	P-value	Mean difference	P-value
ANB	-3. 377	0.000 ***	5.09	0.000 ***	8.467	0.000 ***
NBL	3.233	0. 003 **	2.464(NS)	0. 053	-0.769(NS)	0.546

DISCUSSION

Maxillary Central incisor (CI)

There is a significant difference between both genders and the CI was longer in males in all anteroposterior and vertical skeletal groups and this findings in agreement with Thongudomporn & Freer [10] . They found that short or blunt roots were seen in 23.4% of pretreatment orthodontic patients and significantly more prevalent in females (14.1%) than in males (6.3%) and in disagreement with Arntsen et al [1] . Also there is a significant difference between different vertical skeletal classes in males, and the CI was longer in high angle group compared with normal angle group and this came in disagreement with Arntsen etal [1]who found that the CI was shorter in skeletal open bite group and this difference in findings may be due to that in Arntsen etal [1] study there was an open bite group which may be due to short length of CI while in this study the subjects with high angle regardless to open bite and this high angle could be due excessive maxillary vertical growth in forward downward direction which is combined by similar growth of CI tooth bud and posterior rotation of the mandible.

Nasal bone (NBL)

The results showed that the NBL was shorter in CLII group in both genders and this in agreement with the findings of Arntsen etal [1] and Gulsen et al [11] who found that protrusive maxilla more often accompanies a shorter nose. An explanation of shorter nasal bone in CLII group may be due to that the Class I individuals tend to have a straight dorsum of the nose, whereas in Class II subjects the nose grow more downward than forward, so that the configuration of the nose follows the general convexity of the face [12], so that with a straight nose in Class I cases and more convex nose in Class II cases the convex nasal bone in CLII certainly will be shorter than the straight one in CLI.

Anterior cranial base (SN)

The results showed that there is a highly significant difference in low and high angle males and this disagree with Arntsen etal. The anterior cranial base was longer in low angle group than normal and high angle groups, and this may be due to that increase in the length of SN can affect the anteroposterior and vertical position of the glenoid fossa making it more posterior and more caudal which cause forward rotation of mandible and giving the pattern of low angle [13].

Body height

There was a significant gender difference and males were taller than females in all anteroposterior and vertical skeletal groups and this findings in agreement with Tawfeek [14] .The results showed that there is no significant difference between different anteroposterior and vertical skeletal groups for both genders and this could be due to that body height affected by many hereditary and environmental factors [15].

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