ORIGINAL ARTICLE

EVALUATON OF FH-SN ANGLE IN ORTHODONTIC PATEINTS

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ABSTRACT

As generally accepted mean value of FH-SN angle is 7°. Many previously done studies have shown that fluctuation in FN-SN plane angle exists that might be due to racial or geographic variations. Study was conducted in Nishtar Institute of Dentistry, Multan in February 2019. Lateral cephalogram of 114 orthodontic patients were drawn using 3H pencil and FH-SN plane angle was measured and documented. Lateral cephalogram were ordered into different growth patterns (class I, class II and class III) using wits value. Average FH- SN angle was 7.79°±2.38°. Greatest angle was found in Class III patients. There is significant difference among the different skeletal patterns according to ANOVA test. Average FH-SN angle among patients from Multan was 7.79°±2.38°. There is no significant difference among Class I, Class II and Class III orthodontic patients.

Key Words: *FH plane, Lateral cephalograms and SN plane.*

INTRODUCTION

It is fundamental to understand concepts of craniofacial growth and its fluctuations before any clinical diagnosis and treatment.[1] Cephalometric was introduced in 1931 which led to great assistance in studying changing trends of craniofacial growth in growing individuals. Numerous studies have been done which describes complexity of craniofacial growth.[2]

Different anatomic reference systems are being used for conventional cephalometry. SN and FH planes are two main reference planes being used. These planes are widely used for diagnosis in case of variations in SN inclination.[1] (Figure 1). Some studies have demonstrated that orbitale moves in cranial direction due to resultant growth occurring at lower orbital margin (Or). As a resultant growth, the distance between orbitale and anterior cranial base (SN) also increases due to bony changes.[2]

Orientation of face, palate and chin can evaluated from Frankfort horizontal plane. Due to variation in SN plane inclination makes it inefficient to determine orientation of Facial structures.[3] FH plane has much importance and an agreement in Down's and Tweed's objectives. FH plane variation to true horizontal plane varies around zero degrees.[3,5] In population, it does represent the horizontal to earth's surface. The sella-nasion plane was drawn from S point present at center of Sella turcica to N point present at junction of frontal and nasal bridge. (Fig. 1). In contrast to this selection of points in the interior of the skull, the Frankfort horizontal plane was drawn from the porion present at superior contour of external auditory meatus to orbitale point positoned at lower margin of orbitale.[4] Because both porion and orbitale are located in the external boder of the bony framework of the face. It can be reproduced clinically by drawing imaginary line from tragus of ear to orbitale located on inferior orbital region. These external skeletal landmarks are covered by soft tissue.[5,6]

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MATERIALS AND METHODS

114 Lateral cephalogram (33 Class I cases, 45 Class II cases, 33 Class III cases) were obtained from orthodontic department of Nishter institute of dentistry, Multan, Pakistan. Lateral cephalograms were taken between January 2017 and January 2019. Patient's age ranged from 15years to 30years. Single technician took all the lateral cephlograms by utilizing same radiographic device. This study was carried out by taking permission from institutional review board of NID, Multan. Radiographs were traced by using illuminator to enhance the prominence of anatomical landmarks. 3H pencils were used to trace landmarks on matte acetate sheets. Before constructing SN and FH planes, Tracings were evaluated by another investigator. The angle between Frankfort horizontal and anterior cranial base (FH-SN) was constructed

and documented[7]. A functional occlusal plane (plane connecting distal occluding cuspal tips of U6&L6 and Upm1&Lpm2) was constructed on each tracing by dropping perpendicular from point A and point B (Figure 1)[9]. Wits appraisal was used to categorize skeletal patterns as class1, class2 and class3[10]. Errors occurring while using cephalometric analysis were minimized by method devised by Houstan[11]. Independent t-test and ANOVA analysis were used to assess statistical relationship between the male and female sexes of the sample, Frankfort horizontal and Sella-Nasion plane angle and relationship between class I, class II and class III was evaluated using independent. SPSS 11.0 Software was used for data analysis and presented in tabulated form.

RESULTS

Average age of the given sample was 16.41±4.33 years. 7.79±2.38 was the mean value of resultant FH-SN angle obtained after evaluation. Largest value found among Class III and patients were valued as 8.75±2.37 Table.1. Statistical evaluation did not show significant difference. Table.2. Out of 114 samples, 34 individuals were Class I, 46 were Class II and 34 were Class III. ANOVA analysis was used to analogize three groups. No statistical significant difference was present among three skeletal patterns according to Table 3.

DISCUSSION

This cephalometric study was done over a group of orthodontic patients from Multan region. Main idea behind this study was to evaluate mean angle of FH-SN plane which is 7.79°±2.38°. This value is slightly higher than generally accepted mean value 7°. This discrepancy could be due to Racial and geographical variations of included population. There are some studies which also state some discrepancies greater than 7° as well.[10,11] Overall angle was 7.79°±2.38° in given sample. Angle was slightly higher in skeletal class III individuals by 1.75°. This result is not significant statistically because any difference less than 2° is clinically less important.[12] A study conducted on Korean population also depicted same kind of result with slight fluctuation in FH-SN angle.[13] A slight increasing trend was found in this study from class I to class III skeletal pattern. ANOVA analysis showed statistically insignificant difference mean angle between different skeletal patterns. Study by Alves et al[13] showed different angular change which

TABLE 1: ONE-SAMPLE T-TEST

Variables	Test Value = 0			
	T	Mean Difference	95% Confidence Interval of the Difference	
			Lower	Upper
Mean angel Of Class I	17.652	7.471	6.61	8.33
Mean angel Of Class II	22.714	7.707	7.02	8.39
Mean angel Of Class III	21.483	8.750	7.92	9.58

TABLE 2: ANOVA ANALYSIS

Source of variation	Mean square	F- statistics	P-value
Between groups	16.12	2.86	0.0612
Within the groups	5.63	-	-
Total	-	-	-

TABLE 3: MEAN FH-SN ANGLE

SK. Patterns	Number (n)	Age (yrs.)	Mean angle
Class I	34	14.82±3.17	7.47º±2.47º
Class II	46	17.48±4.26	7.71º±2.30º
Class III	34	16.94±5.58	8.75º±2.37º
Total	114	16.41±4.33	7.79º±2.38º

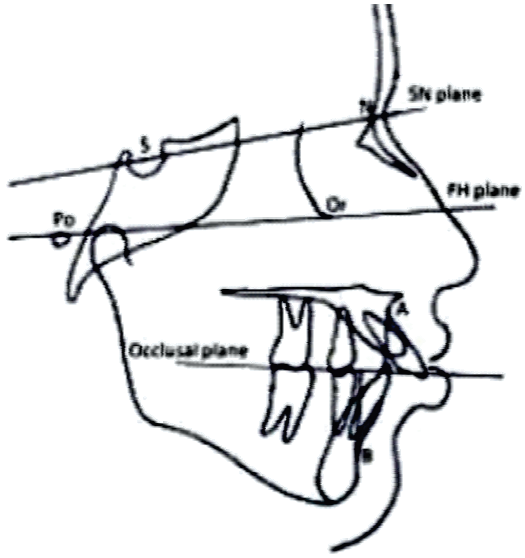

Fig 1: FH plane and SN plane

found higher FH-SN angle in skeletal class2 pattern. This change may be caused by use of different method to classify skeletal patterns. Alves et al[13] used ANB to classify skeletal pattern and nasion can lead to confounfing bias due to its use in ANB and FH-SN. It is more judicious to use wits appraisal to rule out the role of nasion as it has been used in this study. FH-SN angle remains constant throughout life but there are some studies which show change in angle as given in present study.[14] Longitudinal studies are more conclusive in this case to evaluate angular change throughout life.

According to Moore et al[15] increase in FH-SN angle results in reduction of both SNA and SNB angle. FH-SN angulation shows variation due to change in either anterior cranial base length or distance between porion and orbitale. If fluctuation in FH-SN angle occurs due to variation in anterior cranial base orientation then use parameters based on Frankfort Horizontal plane for diagnostic evaluations. Frankfort horizontal plane also impact FMA angulation in determining vertical skeletal pattern as confirmed by local study.[16] That's why it is important to use FH-SN angle for cephalometric diagnosis. As cephalometric reference planes are poorly correlated to reach proper diagnosis. It is better to use more than one reference plane to reach more judicious diagnosis.[17] Alternatively perpendicular lines from SN and FH planes can be used for cephalometric diagnosis.[18]

CONCLUSION

A wide range of FH-SN plane angle was found in orthodontic patients from Multan region from 3.5° to 15°.The mean angle for this group of patients from Multan region was found to be 7.79°±2.38°. There was no statistical difference in angular change from skeletal class I to skeletal class III pattern.

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CONTRIBUTIONS BY AUTHORS

1 Faisal Rasheed:	Contribution to study design, patinet data collection for work and drafting the work after critically revisiting it. Final approval article version to be published.
2 Zubair Hassan Awaisi:	Contribution in patient data collection and evaluation of article's plagiarsim.
3 Saad Amin Malik:	Approval of topic and final evaluation of data.
4 Abid Hussain Kanju:	Interpertation of data being collected and revisiting it critically
5 Zubair Ahmed:	Substantially contributed to conception.
6 Taimoor Khan:	Acquisition of data for work and contribution to analysis of integrity of the data and resolved.