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Research Article

Point Orbitale ["Or"] - The Pivot of Naso-maxillary Complex (Part-I)

Pawar Vasant[1], Taji Mangal Singh J[1]* and Jain Hitendra R[2]

[1]*M.D.S. (Orthodontontics and Dentofacial Orthopaedics), S.M.B.T. Dental College and Hospital, Ahmednagar, Maharashtra, India*

[2]*M.D.S. (Public Health Dentistry), S.M.B.T. Dental College and Hospital, Ahmednagar, Maharashtra, India*

***Corresponding Author**: Taji Mangal Singh J, M.D.S. (Orthodontontics and Dentofacial Orthopaedics), S.M.B.T. Dental College and Hospital, Ahmednagar, Maharashtra, India.

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Abstract

Aim: To ascertain the use of orbitale as a guide for various cephalometric analysis to determine skeletal malocclusion and to find correlation among angles S-Or-A, S-Or-B, A-Or-B with S-N-A, S-N-B, A-N-B and to evaluate the linear correlation between S-Or and Or-A.

Subject and Methods: This study type was carried out using Forty-four lateral cephalogram, of patients having CLASS I skeletal malocclusion between the age group of 18-32 years and were randomly selected with no history of orthodontic treatment and any systemic bone disease.

Result: Mean and Standard Deviation of measurements like angular measurement (in degrees) and linear measurement (in cms). Pearson correlation test was used to find correlation among angles S-Or-A, S-Or-B, A-Or-B with S-N-A, S-N-B, A-N-B and to evaluate the linear correlation between S-Or and Or-A.

Conclusion: The growth and ossification of orbit is complete at the time of birth and is not affected by age related changes. The position of the orbitale in a cephalogram in relation to maxilla remain constant throughout life. Although the changes take place in maxilla and dento-alveolar process, orbitale remain as a stable point which is more near to the normal occlusion plane than that of nasion which is a part of cranial cavity.

Keywords: *Stable Point-Orbitale; Sella; Frankfurt-Horizontal Plane; Skeletal Malocclusion*

Abbreviations

point S: Sella; point N: Nasion; point A: Point A; point B: Point B; point Or: Point Or; angle SOrA: Angle Sella-Orbitale-Point A; angle SOrB: Angle Sella-Orbitale-Point B; angle AOrB: Angle Point A-Orbitale-Point B; angle SNA: Angle Sella-Nasion-Point A; angle SNB: Angle Sella-Nasion-Point B; angle ANB: Angle Point A-Nasion-Point B

Introduction

The cephalometer is the most important of all the contribution to study growth and development. After the introduction of cephalometer by Broadbent in 1931, lateral cephalometric radiography has been widely used in orthodontics. It is used to characterize facial morphology, to predict the growth of the facial skeleton, to plan orthodontic treatment, and to evaluate treatment outcomes [1].

Cephalometric anatomical landmarks may be unilateral or bilateral. Commonly use cephalometric anatomical landmarks includes sella, nasion, orbitale, subspinale, ANS, PNS, supramentale, ptm (Pterygomaxillary fissure), pogonion, gnathion, menton, gonion, porion, articulare, condylion, basion, etc [2]. Among these landmarks, Orbitale "Or" is a stable reference point in the mid-face region which is not affected by age related changes, and therefore can be used as a stable cephalometric reference point to study and establish a sagittal as well in vertical relation between point "Or" and point "S", "Or" and point "A", and point "Or" and point "B".

The growth and ossification of orbital bony cavity is complete at the time of birth [3]. The floor of the orbit is formed by the orbital plate of the maxilla. The growth of the orbital plate of the maxilla, being part of the orbital bony cavity, is complete at the time of birth and mostly is not affected by age related changes [4]. The length of the superior and inferior orbital rim remains relatively same throughout the life, and the position of the orbitale in a cephalogram in relation to inferior orbital rim also remains constant throughout life [5]. The rest of the maxilla and dento-alveolar region is strongly affected by age related changes.

Purpose of the Study

The purpose of the study is to use orbitale as a guide for various cephalometric analysis to determine skeletal malocclusion and to find correlation among angles S-Or-A, S-Or-B, A-Or-B with S-N-A, S-N-B, A-N-B and to evaluate the linear correlation between S-Or and Or-A.

Materials and Methods

Forty-four lateral cephalogram were selected from patients having Class I skeletal malocclusion between the age group of 18 - 32 years with no history of orthodontic treatment and any systemic disease. Tracing was performed on acetate matte tracing paper using a lead marking pencil. Different points marked were "S" - Sella Turcica, "Or" - Point orbitale, "N" - Point nasion, Point "A" - Subspinale and Point "B" - Supramentale. Lines were drawn connecting S-N, N-A, N-B, N-Or, S-Or, Or-A and Or-B. Angles formed by these lines were S-N-A, S-N-B, A-N-B, S-N-Or, Or-N-A, Or-N-B, S-Or-A, S-Or-B and A-Or-B. Angular measurement was taken by using protractor and noted in a table. Linear measurements was taken from "S" to "Or" and "Or" to "A" by using a steel rule (scale) and noted in a table.

The data obtained was entered in Microsoft Excel sheet and proper statistical analysis was done. Mean and standard deviation of angular and linear measurements were obtained. Correlation of angles with age was done by using Pearson correlation test. Correlation among angles S-Or-A, S-Or-B, A-Or-B with S-N-A, S-N-B, A-N-B and the linear correlation between S-Or and Or-A was done using Pearson test.

Results and Discussion

Result

Mean and S.D values of SNA, SNB, ANB angles was found to be 82.93 ± 4.26, 80.18 ± 4.08 and 2.95 ± 1.46 degrees respectively. Mean and S.D values of SOrA, SOrB and AOrB angles was found to be 134.8 ± 10.07, 117.34 ± 7.18 and 17.75 ± 3.56 degrees respectively. Mean and S.D values of linear measurement of SOr, OrA and S-Or-A were around 4.6 ± 0.39, 2.76 ± 0.37 and 7.36 ± 0.39 cms respectively.

Strong significant positive correlation (r = 0.914) was found to be present between angle SNA and SNB on using Pearson correlation test. Similarly, strong significant positive correlation (r = 0.730) was found to be present between angle S-Or-A and S-Or-B using orbitale as point of measurement (Table 1 and 2). All angular measurements involving both landmarks nasion (N) and orbitale (Or) respectively correlation analysis was performed. There exists moderate positive correlation among S-Or-A and S-N-A (r = 0.297, p = 0.046), S-Or-B and S-N-B (r = 0.413, p = 0.005). Positive non-significant correlation was observed among A-Or-B and A-N-B (r = 0.118, p = 0.445) (Table 3). On comparison of linear measurements among S-Or and Or-A, it was observed that there exists negative significant correlation among S-Or and Or-A (Table 4 and 5).

Variables (in degrees)	Mean	STD. Deviation	STD. Error
SNA	82.93	4.26	0.64
SNB	80.18	4.08	0.61
ANB	2.95	1.46	0.22
SNOr	52.77	6.66	1.0
OrNA	29.84	6.25	0.94
OrNB	27.18	5.89	0.88
AOrB	17.75	3.56	0.53
SOrA	134.8	10.07	1.51
SOrB	117.34	7.18	1.08
(in cms)	**Mean**	**STD. Deviation**	**STD. Error**
SOr	4.60	0.39	0.05
OrA	2.76	0.37	0.05
S-Or-A	7.36	0.39	0.05

Table 1: *Descriptive statistics regarding angular and linear measurements recorded on lateral cephalograms.*

		SNA	SNB	ANB
SNA	Correlation coefficient (r)	1	0.914	0.279
	p value	-	P < 0.001**	P = 0.066
SNB	Correlation coefficient (r)	0.914	1	-0.053
	p value	P < 0.001**	-	P = 0.732
ANB	Correlation coefficient (r)	0.279	-0.053	1
	p value	P = 0.066	P = 0.732	-

Table 2: *Pearson correlation analysis among SNA, SNB and ANB.*

*p > 0.05: Not significant; * p < 0.05: Significant; ** p < 0.001: Highly significant.*

		AOrB	SOrA	SOrB
AOrB	Correlation coefficient (r)	1	0.722	0.509
	p value	-	P < 0.001**	P < 0.001**
SOrA	Correlation coefficient (r)	0.722	1	0.730
	p value	P < 0.001**	-	P < 0.001**
SOrB	Correlation coefficient (r)	0.509	0.730	1
	p value	P < 0.001**	P < 0.001**	-

Table 3: *Pearson correlation analysis among AOrB, SOrA, SOrB.*

*p > 0.05: Not significant; * p < 0.05: Significant; ** p < 0.001: Highly significant.*

		S-Or-A	S-Or-B	A-Or-B
SNA	Correlation coefficient (r)	0.297		
	p value	P = 0.046*		
SNB	Correlation coefficient (r)		0.413	
	p value		P = 0.005*	
ANB	Correlation coefficient (r)			0.118
	p value			P = 0.445

Table 4: *Pearson correlation analysis of angles S-Or-A, S-Or-B, A-Or-B with S-N-A, S-N-B, A-N-B.*

*p > 0.05: Not significant; * p < 0.05: Significant; ** p < 0.001: Highly significant.*

	Pearson Correlation	OrA
SOr	Correlation coefficient (r)	- 0.469
	p value	p = 0.001*

Table 5: *Pearson correlation analysis among SOr and OrA , SOr and OrB.*

*p > 0.05: Not significant; * p < 0.05: Significant; ** p < 0.001: Highly significant.*

Discussion

The idea that porion and orbitale would form a plane parallel to the reference horizontal was originally adopted at an anthropologic congress in Frankfort, Germany, in 1882, referred as Frankfort horizontal plane [5-7]. The growth and ossification of orbital bony cavity is complete at the time of birth [8]. The floor of the orbit is formed by the orbital plate of the maxilla. The growth of the orbital plate of the maxilla, being part of the orbital bony cavity, is complete at the time of birth and mostly is not affected by age related changes [9]. The length of the superior and inferior orbital rim remains relatively same throughout the life, and the position of the orbitale in a cephalogram in relation to inferior orbital rim also remains constant throughout life [10]. The rest of the maxilla and dento-alveolar region is strongly affected by age related changes [11].

The negative significant correlation among S-Or and Or-A suggests that when S-Or distance increases, Or-A distance decreases and vice versa indicating that there exists fixed stable distance between point 'S' and 'A' measured via point 'Or' in lateral cephalograms. It was also observed that linear measurement of SOr, OrA and S-Or-A has very less variance (0.39, 0.37, 0.39) respectively in our study population (Table 1) indicating the relative stability of linear measurements involving orbitale 'Or'.

Mean and S.D values of SNA, SNB, ANB angles was found to be 82.93 ± 4.26, 80.18 ± 4.08 and 2.95 ± 1.46 degrees respectively. These measurements in our study are in accordance with the standard mean cephalometrics values found in Class I population. Similarly, Mean and S.D values of SOrA, SOrB and AOrB angles found to be 134.8 ± 10.07, 117.34 ± 7.18 and 17.75 ± 3.56 degrees respectively in our study can be useful to find standard angular measurement including orbitale for future cephalometrics studies. This findings can be strengthen by future research on reliability of angular measurements involving orbitale conducted on large population.

Conclusion

The growth and ossification of orbit is completed at the time of birth and is not affected by age related changes. Orbitale is a point located in the infra-orbital region. The position of the orbitale in a lateral cephalogram in relation to maxilla remain constant throughout life. Although the changes take place in maxilla and dento-alveolar process, orbitale remain as a stable point which is more near to the normal occlusion plane than nasion which is a part of cranial cavity. Point "N" nasion varies with the age related changes in the cranial cavity. Our study findings regarding orbitale as a stable cephalometric landmark ascertain its use as a guide for various cephalometric analysis.

Acknowledgements

Nil.

Conflict of Interest

Nil.

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