Changes in Cranial Base Morphology in Class I and Class II Division 1 Malocclusions

Anirudh Agarwal[1], Harsh Pandey[2], Kamal Bajaj[3], Lavesh Pandey[4]

[1]Professor, Department of Orthodontics, Rajasthan Dental College & Hospital, Jaipur, Rajasthan; [2]Senior Lecturer, Department of Orthodontics, Rajasthan Dental College & Hospital, Jaipur, Rajasthan; [3]Reader, Department of Orthodontics, Rajasthan Dental College & Hospital, Jaipur, Rajasthan; [4]Senior Lecturer, Department of Orthodontics, Rajasthan Dental College & Hospital, Jaipur, Rajasthan.

ABSTRACT

Introduction: The cranial base plays a key role in craniofacial growth; it helps to integrate spatially and functionally different patterns of growth in various adjoining regions of the skull such as components of the brain, the nasal and oral cavity and the pharynx. The aim of this study was to evaluate the difference in cranial base flexure between skeletal and dental Class I and Class II division 1.

Materials & Methods: Lateral cephalometric radiograph, of Class I and Class II with an average growth pattern were analyzed and compared. A total of 103 patients having class I (n=52) and class II (n=51) malocclusion, were taken from Department of Orthodontics, Rajasthan Dental College & Hospital, Jaipur. Cranial base angle (N-S-Ar) and ANB were measured on pre treatment lateral cephalograms.

Results: In this study cranial base angle did not show statistically significant difference between the two groups studied.

Conclusion: In the assessment of orthodontic problems involving anteroposterior malrelationships of the jaws, the problem is usually the result of size, form and position of the jaw. The present study failed to find any differences in cranial base angle between sagittal malocclusions.

Key words: Cephalometric, cranial base angle, Malocclusion, Class I, Class II Division 1.

How to cite this article: Agarwal A, Pandey H, Bajaj K, Pandey L. Changes in Cranial Base Morphology in Class I and Class II Division 1 Malocclusion. *J Int Oral Health 2013; 5(1):39-42.*

Source of Support: Nil
Conflict of Interest: None Declared

Received: **13th November 2012**
Reviewed: **11th December 2012**
Accepted: **12th January 2013**

Address for Correspondence: Dr. Anirudh Agarwal, F-25, IV th Avenue, Lal Badhur Shastri Nagar (west), Malviya Nagar, Jaipur. Tel :+919414065588. e-mail : docanirudh@yahoo.com.

Introduction

The cranial base supports the brain and provides adaptation between the developing neurocranium and viscerocranium during growth. Located on a junction point between the cranium, midface and glenoid fossa, the cranial base occurs between 14 and 32 weeks of fetal life and second spurt occurs during the first year after birth. Besides, the cranial base reaches 90% of its adult size at 13th year of life, much later than head circumference.

It was also noted that the saddle angle decreases from birth through the first year of life. The cranial base angle becomes more acute during infancy and stays constant after the age of 2 years.[1]

Kerr[2] observed the saddle angle to be one of the constant that shows very little change during the growth period from the age of 5 to 15.

The cranial base plays a key role in craniofacial growth; it helps to integrate spatially and functionally different patterns of growth in various adjoining regions of the skull such as components of the brain, the nasal and oral cavity and the pharynx.

Depending on the fact that the maxilla is connected with the anterior part of the cranial base and the rotation of the mandible is influenced by the maxilla, a relationship can be found between the cranial base variations and sagittal malpositions of the jaws.

Table 1: T-test: Two-sample assuming unequal variance

	Class I	Class II division 1
Mean	123.81812	124.0562
Variance	14.72727	21.7193
Standard deviation	3.837	4.660
Observations	52	51
Hypothesized mean difference	0	
t start	-0.17414	
P (T<=t) one-tail	0.431378	
t critical one-tail	1.689572	
P (T<=t)two-tail	0.862757	
t critical two-tail	2.030108	

Hopkin et al [3] found that the cranial base length and angle increase from Angle class III through Class I to Class II Div I malocclusion.

Anderson[4] and Popovitch observed that the individuals with the largest cranial base angle showed a Class II tendency.

Jarvinen[5] noted that Class II patients showed a higher ArSN angle than Class III patients.

Other researches have reported similar findings and concluded that the cranial base flexure is more obtuse, S-N (anterior cranial base) and S-Ba (posterior cranial base) lengths are longer and the condylar neck is positioned more posterior in class II individuals.

Other researches have reported similar findings and concluded that the cranial base flexure is more obtuse, S-N (anterior cranial base) and S-Ba (posterior cranial base) lengths are longer and the condylar neck is positioned more posterior in class II individuals.

Different factors like basicranial morphology, head and neck posture and soft tissue stretching are thought to influence the occurrence of a skeletal malocclusion.

The influence of cranial base angulations as a factor in the etiology of sagittal jaw discrepancies is still a matter of debate.

Kasai et al [6] investigated the relationship of the cranial base and maxillofacial Morphology in Japanese crania and did not find differences between Class I And Class II samples. Similarly, Wilhelm et al. 7 did not observe any differences

For the cranial base measurements between the Class I and Class II Skeletal patterns. Different studies sustaining these findings are also present [7, 8]

Aim:

The purpose of this cross-sectional retrospective study is to investigate any possible differences in the shape and position of the cranial base in Class I, Class II division 1 skeletal patterns.

Material and methods:

Lateral cephalometric films were obtained from the initial records of 103 patients, having class I [n=52, (27 male and 25 female)] and class II [n=51, (25 male and 26 female], who presented for seeking orthodontic treatment at Department of Orthodontics.

The criteria for the selection of patients were:

Group 1: Skeletal class I malocclusion with an ANB angle of 2 ± 2°, favorable overjet and overbite and minimal crowding of both arches.
Group 2: Skeletal Class II division 1 malocclusion with an ANB angle of +5° or more, increased overjet.
Patients, who presented any oral habit (as determined from the history), were excluded from the study.
All of the patients were at the post pubertal growth spurt stage according to cervical vertebrae maturation index (CV4 developmental stage).

Cephalometric analysis:

The lateral cephalometric radiographs of each subject were taken with a Soredex Cranex Cephalometer at Department of Oral Medicine and Radiology, Rajasthan Dental College & Hospital, Jaipur.
All subjects were positioned in the cephalostat with the sagittal plane at a right angle to the path of the X-rays, the Frankfort plane parallel to the horizontal, the teeth in centric occlusion, and the lips slightly closed.
The radiographs were hand traced and were measured.
The following landmarks were used for cephalometric analysis: point A (A),
Point B (B), sella(S), nasion (N), articulare (Ar).
The following measurements were used:
Angular measurements for the assessment of sagittal growth pattern: ANB Angular measurements for the assessment of cranial base flexure: N-S-Ar.

Statistical analysis:

The mean and standard deviations were estimated for each cephalometric variable in each group.
The intra operator error was not significant.
Differences between the groups were evaluated using't' Test. Significance for tests was predetermined as $p<0.05$.

Results:

The cranial base flexure was evaluated according to N-S-Ar angular measurements.The N-S-Ar angle showed the gradual increase from class I to class II division I (Table 1). No significant differences were measured between the groups.

Discussion:

In the assessment of orthodontic problems involving anteroposterior malrelationships of the jaws, the problem is usually the result of size, form and position of the jaw.
Despite the effects of head posture, breathing mode or even spine position that have been shown to influence craniofacial morphology, cranial base flexion has been put forward to be a possible indicator of a skeletal malocclusion.
The study failed to demonstrate any differences in cranial base flexure in different malocclusions.
Due to the present controversy, the main purpose of the present study was to investigate, in a cross-sectional sample, whether the cranial base flexure or the shape of the cranial base could show morphological differences in skeletal class I, and class II division 1 malocclusions.
It is difficult to exclude all possible factors that influence the occurrence of a skeletal dysplasia.
In choosing the class I and class II samples, care was given not to choose subjects who have extremely small or huge jaws.
Mouth breathers or patients with any other oral habits were excluded to minimize the effects of any other etiological factor that play a role in development of a specific skeletal class.
The results of this study failed to demonstrate any differences between the two groups studied in cranial base angle measured articulare.

These results were consistent with the findings of Hildwein et al.[9], Kasai et al. [6] And Wilhelm et al. [7] It has been suggested that cranial base flexure influences mandibular prognathism by determining the anteroposterior position of the condyle relative to the facial profile.[10]

Conclusions:

Cranial base angle measurements: (N-S-Ar) did not demonstrate statistically significantly differences between the malocclusions .Clearly, the cranial base angle is not the only factor in determining a malocclusion.

According to Scott [11], three main factors influence facial prognathism - opening of the cranial base angle, the relative forward movement of components such as the maxilla and the mandible to the cranium and the amount of surface deposition along the facial profile between the nation and menton.

The present study failed to find any differences in cranial base angle between sagittal malocclusions.

References:

1. Lewis AB, Roche AF. The saddle angle: constancy or change? Angle Orthod 1977; 47:46–54.
2. Kerr WJ, Hirst D. Craniofacial characteristics of subjects with normal and post normal occlusions. Am J Orthod Dentofacial Orthop 1987;92(3):207-12.
3. Hopkin GB. Mesio-occlusion, a clinical and roentgenographic cephalometric study. PhD Thesis. Edinburgh: University of Edinburgh; 1961.
4. Anderson DL, Popovich F. Lower cranial height versus craniofacial dimension in angle class II malocclusion. Angle Orthod1983;53(3):253-60.
5. Jarvinen S. Saddle angle and maxillary prognathism: a radiological analysis of the association between the NSAr and SNA angles. Br J Orthod 1984;11(4):209-13.
6. Kasai K, Moro T, Kanazawa E, Iwasawa T. Relationship between cranial base and maxillofacial morphology. Eur J Orthod1995;17(5):403-10.
7. Wilhelm BM, Beck FM, Lidral AC, Vig KW. A comparison of cranial base growth in class I and class II skeletal patterns. Am J Orthod Dentofac Orthop.2001;119(4):401-5.
8. Rothstein T, Phan XL. Dental and facial skeletal characteristics and growth of females and males with Class II division 1 malocclusion between the ages of 10 and 14. Am J Orthod Dentofacial Orthop 2001 ;120(5):542-55.
9. Hildwein M, Bacon W, Turlot JC, Kuntz M. Spe´cificite´s et discriminants majeurs dans une population de Classe II division 1 d_Angle. Revue d_Orthope´die Dento-Faciale 1986; 20:197–298.
10. Sarnas KV. Inter- and intra-family variations in facial profile. Odont Rev 1959; 10(Suppl. 4)
11. Scott JH. Dento-facial Development and Growth. Oxford: Pergamon Press; 1967.