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علاقة الميلان السهمي للقمة الفكية مع الصفات الشكلية للعلاقة القاطعية السهمية لدى ذكور بالغين ذوي إطباق صنف أول هيكلي (دراسة سيفالومترية)

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□ ملخّص □

قامت الأبحاث السيفالومترية بتقصي مدى أهمية التوع السهمي للقم الفكية وذلك بالنسبة لبقية العناصر المكونة للمركب القحفي الوجهي المؤثرة على نمو والصفات الشكلية للعلاقة الإطباقية، إلا عنصر العلاقة القاطعية السهمية.
الهدف: هو تحري إمكانية وجود علاقة ما بين الميلان السهمي للقم الفكية وبين التداخل القاطعي السهمي وذلك من خلال قيم السيفالومترية الجبهية والجانبية لدى ذكور بالغين ذوي إطباق صنف أول هيكلي أصحاء وغير معالجين وذلك من الناحية التقويمية وبدون قصة سريرية سابقة لإضطرابات في المفصل الفكي الصدغي ولا أي مظاهر سريرية لها.

مواد وطرائق البحث: تم انتقاء 14 ذكر بالغ ممن لم يخضعوا لمعالجة تقويمية سابقة، ذوي إطباق صنف أول هيكلي (تراوحت أعمارهم ما بين 20 إلى 24 سنة)، وبدون قصة سريرية سابقة لإضطرابات في المفصل الفكي الصدغي ولا أي مظاهر سريرية لها. النتائج: أوضحت نتائج تحليل معامل ارتباط Pearson علاقة ضعيفة ومختلفة في الإتجاه (معظمها كان سلبياً) ما بين زاوية الميلان المحوري للقمة الفكية وبين قيم المتغيرات السيفالومترية التي تم من خلالها تقييم الصفات المورفولوجية للعلاقة القاطعية السهمية. الخلاصة: لدى أفراد عينة هذا البحث لم نجد علاقة ذات دلالة إحصائية هامة ما بين ميلان اللقمة الفكية السهمي وبين قيم المتغيرات السيفالومترية التي تم من خلالها تقييم الصفات المورفولوجية للعلاقة القاطعية السهمية.

كلمات مفتاحية: ميلان اللقمة الفكية السهمي، العلاقة القاطعية السهمية، صنف أول هيكلي، الصور الشعاعية السيفالومترية الجانبية.

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Mandibular Condyle Sagittal Inclination Relation with the Sagittal Incisal Interface Morphology in Adult Male with Skeletal Class I Occlusion(Cephalometric Study)

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□ ABSTRACT □

Cephalometric researches inspected the most the consequence of the sagittal condylar position and inclination with other elements of the craniofacial complex that influencing with the growth, and morphology of the occlusion relationship, but not with the sagital incisal interface Aim is to hunt for possible relationship between the mandibular condyle sagittal inclination and the sagittal incisal interface morphology among orthodontically healthy and untreated skeletal class I adult male subjects with no history of temporomandibular joint disorders nor any clinical signs of it. Materials and methods: 14 orthodontically non-treated skeletal class I adult male subjects (age ranged between 20 and.24 years) with no history of TMDs, nor any clinical signs of it. Pearson's Correlation Coefficient was calculated. Results: Pearson's correlation test showed weak strength but vary in direction (mostly negative) correlation between axial condylar angle and cephalometric measurements establishing the sagittal incisal interface morphology. Conclusion Within all sample's subjects, there is no significant relationship between the sagittal condylar angulation and the cephalometric measurements determining the sagittal incisal interface morphology.

Key Words: mandibular condyle sagittal inclination; sagittal incisal interface morphology, skeletal class I , lateral cephalometric.

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Incisal guidance is the path on the lingual surface of the maxillary anterior teeth along which the mandibular anterior teeth glide. The morphology of the sagital incisal interface playing an important role in this kinetic conception. However, to achieve sagital movements of the mandible, condylar guidance will participate with the incisal guidance.

Numerous investigations have studied this participation in motion and static, nonetheless, there only few researches apprehend the role of the static centric sagital occlusion type in formatting the morphology of the anatomic elements constituting booth condylar and Incisal guidances [1-5], although it have been stated that the static centric occlusion in harmony with the centric maxillomandibular relation is one of important objective of an occlusal rehabilitation [6-8].

Sagital skeletal occlusion are commonly defined by the relationship of the maxilla and mandible to the cranium where the upper and lower dental arches are in the centric occlusion. Mandibular condyle sagittal inclination playing very important role in the growth of the craniofacial complex, and hence, in the process of its morphological formation of the sagittal skeletal occlusion [9].

Study Objectives

The purpose of the present study is to hunt for possible relationship between the mandibular condyle sagittal inclination and the sagittal incisal interface morphology among orthodontically healthy and untreated skeletal class I adult male subjects with no history of temporomandibular joint disorders nor any clinical signs of it.

MATERIALS AND METHODS

Sample estimation:

An evaluation of clinical and radiological data of 110 preorthodontic adult patients who required orthodontic treatment was performed. Only 14 adult males with ages that ranged from 20 to 24 years, mean chronologic age of 22 years 6 months (± 10 months), that their clinical and radiological examination results run into the terms of our criteria (stated below) of selecting subjects in the current study; Furthermore, needed ethical approval was obtained methodically.

Criteria of Subjects selecting*:*

The skeletal class was defined on the base of ANB angle. Subjects were considered in skeletal class I if the ANB angle ranged between 2° ± 2°. [10]

Subjects with history of trauma to the dento-facial structures, history of abnormal habits, supernumerary teeth and/ or missing teeth, congenital anomalies, evident signs of syndromes and/or dentoskeletal asymmetries and/or craniofacial malformation were excluded also. Additionally, exclusion clinical criterion was teeth crowding, crossbites, and any clinical signs or history of temporomandibular joint disorders such as TMJ sounds (clicking or crepitation), range and deviation of mouth opening, tenderness to palpation of the joint and the masticatory muscles, and joint or muscle pain during mouth opening and protrusive or lateral mandibular movements. Moreover, TMD patients revealed by the manual functional analysis (MFA) examination technique intended for patients with no history of symptoms according to Baumann and Groot [11,12] were also excluded.

Should be noted that, only the first part of (MFA) was performed, were the loading vector usually determined. In this study, panoramic radiography has been used as a screening tool to exclude patients with gross bony changes in the condyle as Crow recommended. [13]

All sagittal cephalograms were obtained before any orthodontics treatment has taken place using the same cephalometer in centric occlusion (The standard cephalometer settings were 75 kV, 10 mA, 0.7 second exposure time, with magnification standardized at 10 per cent.). To eliminate rotational errors, ear-rods and nasal rest were used The source–transporionic axis distance was 150 cm and the transporionic axis–film distance 12,5 cm. The subjects were positioned with the transporionic axis and Frankfort plane horizontal to the floor. The films were scanned at 600 dpi and displayed on a flat screen personal computer monitor with a pixel size of 0.051 mm, smaller than the 0.1 mm maximum [14].

All measurements on sagittal cephalograms were digitized by the researcher under identical conditions using AudaxCeph software (sizes were to the nearest 0.01 mm).

Measurements used on lateral cephalograms*:*

The following cephalometric items were measured:

- First group of cephalometric measurements: *establishing the skeletal relationship between the maxilla and the mandible*.

1) SNA angle, 2) SNB angle, 3) ANB angle, 4) B angle: Mandibular Plane (a line drawn from Go to Me) to Palatal Plane angle (a line through the anterior and posterior nasal spines).

- Second group of cephalometric measurements group: *establishing the sagittal incisal interface morphology.*

1) U to NA : shortest distance from edge of the most prominent upper incisor to the NA line, 2) ∠U to NA : angle formed by the NA line and the axis of the most prominent upper incisor, 3) L to NB : shortest distance from edge of the most prominent mandibular incisor to the NB line,

4) ∠L to NB angle formed by the NB line and the axis of the most prominent lower incisor.

5) Interincisal angle: the angle between long axes of the upper and the most prominent lower incisors.

P.S. Go-gonion: A constructed point, located by bisection of two tangents, one on the inferior posterior border of the mandible and the other to the posterior border of the ramus.

- Cephalometric landmarks and lines establishing the Axial Condylar Angle (∠ACA) *(fig 1)*

Condylar axis on the sagittal cephalograms created according to the technique described by Tadej [15] were Ca-Cp describes the broadest distance of the condyle. The Condylar axis is that perpendicular line to the Ca-Cp line drawn from the middle of the Ca-Cp line.

We suggest the Axial Condylar Angle as the number of degrees indicated by the intersection between the condylar axis (by Tadej described above) and the line that connected the highest point of the tuberculum (T in Figure 1), with the most inferior point located on the external auditory meatus (Por` in Figure 1).

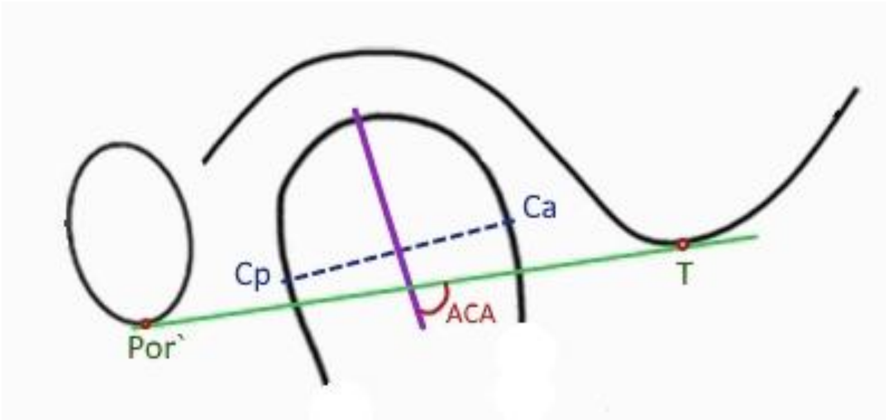

Figure 1 : Cephalometric landmarks and lines establishing the Axial Condylar Angle (∠ACA).

Error of method:

In order to evaluate individual landmark intraoperator reproducibility, same researcher redigitized all cephalograms 1 month later using the same AudaxCeph software. Random and systematic errors were calculated using the coefficient of reliability and a two-sample t-test where the level of significance was 0.95 for the random error values. None of the measurements between the first and the second digitizing was found to be statistically significantly different at the $P < 0.1$ for systematic errors.

Statistical method*:*

Using Microsoft Excel of Microsoft office 2013, Pearson's Correlation Coefficient was calculated to investigate the relationship between (∠ACA) and all other cephalometric measurements (from booth of first and second cephalometric measurements groups).

RESULTS

Descriptive statistics for all suggested cephalometric measurements in this study are shown in Table 1.

Table 1: Descriptive statistics all suggested cephalometric measurements in this study.

	Mean	Standard Error	Standard Deviation	Sample Variance	Range	Min.	Max.	Confid. Level: 95 %
SNA	80.79	1.20	3.78	14.31	14.61	73.12	87.72	2.71
SNB	77.55	0.99	3.14	9.84	11.97	71.77	83.74	2.24
ANB	3.23	0.41	1.29	1.67	3.72	1.19	4.91	0.92
"B" angle	24.44	1.51	4.76	22.67	14.46	19.49	33.95	3.41
U to NA	3.43	0.84	2.66	7.05	8.29	-1.58	6.72	1.90
∠U to NA	20.09	1.90	6.02	36.18	15.96	11.53	27.49	4.30
L to NB	5.61	0.82	2.58	6.68	8.20	0.87	9.08	1.85
∠L to NB	26.30	1.42	4.50	20.25	13.12	18.42	31.53	3.22
Interincisal angle	130.38	2.89	9.15	83.64	26.39	119.06	145.45	6.54
(∠ACA)	64.83	2.28	7.22	52.14	21.77	51.98	73.76	5.17

Pearson's Correlation test was performed to investigate the relationship between the Axial Condylar Angle (∠ACA), and the cephalometric measurements that establishing the sagittal incisal interface morphology (i.e. the second group of cephalometric measurements). Furthermore, Pearson's Correlation test was performed to investigate the relationship between the Axial Condylar Angle (∠ACA), and the cephalometric measurements that establishing the jaws skeletal relationship (i.e. the first group of cephalometric measurements) and that to investigate any indirect effect of the sagittal jaws skeletal relation on the sagittal incisal interface morphology, and consequently on the relationship between the mandibular condyle sagittal inclination and the sagittal incisal interface morphology. In Table 2. presented results of Pearson's Correlation test between axial condylar angle on the one hand, and all other cephalometric measurements suggested in this study on other hand.

Table 2 Pearson's Correlation test between axial condylar angle (∠ACA) , and all other cephalometric measurements suggested in this study.

	First group of cephalometric measurements				Second group of cephalometric measurements				
	SNA	SNB	ANB	"B" angle	U to NA	∠U to NA	L to NB	∠L to NB	Interincisal angle
∠ACA	0.15	0.10	0.19	-0.37	-0.39	-0.23	-0.60	-0.21	0.23
Correlation strength & direction.	▲	▲	▲	▼	▼	▼	▼	▼	▲

▲: *Positive weak strength of correlation*, ▼: *Negative weak strength of correlation*.

Within all sample's subjects, Pearson's Correlation test showed weak strength, but vary in direction (mostly negative) correlation between Axial Condylar Angle (∠ACA) and the cephalometric measurements of the second group which defining the sagittal incisal interface morphology.

Likewise, the Pearson's Correlation test showed also a weak strength, but vary in direction (mostly negative) correlation between Axial Condylar Angle (∠ACA) and the cephalometric measurements of the first group defining the skeletal relationship between the maxilla and the mandible.

DISCUSSION:

In this investigation, the relationship between the mandibular condyle sagittal inclination and the sagittal incisal interface morphology has been clinically, and cephalometrically thoroughly studied among orthodontically non-treated skeletal class I adult male subjects with no history of temporomandibular joint disorders nor any clinical signs of it.

Cephalometric researches inspected the most the consequence of the sagittal condylar position with other elements of the craniofacial complex that influencing with the growth, and morphology of the occlusion relationship, but not with the sagital incisal interface particularly as one of the fundamental concepts of static occlusion as this study tried to do.

On the whole, the results of this investigation find no statistical significant relationship between the sagittal condylar angulation (∠ACA) and all rest of the cephalometric measurements that was set up according to the aims of this study, however, this study reveals negative correlation between the axial condylar angle and both of angular and liner measurements: (∠U to NA), (∠L to NB), (U to NA), (L to N), that establishing the sagittal incisal interface morphology (i.e. the second group of cephalometric measurements). Nevertheless, this correlation was a weak, but its reveals, that within sample's subjects, the more size increasing of the axial condylar angle, the less increasing the distance from edge of the most prominent incisors (upper and lower), and the less of its angulations to the related lines (NA and NB), and vice versa. This could be lead to think that this correlation was acquired, maybe, as a kind of compensation process, especially if we take into consideration the positive relationship (regardless of being a weak relationship) between the axial condylar angle, from one hand, and both of (Interincisal angle) and (B angle) from other hand.

No previous researchers studied this exact correlation to compare with, but nevertheless, one might think this was very close to the philosophy of Stiner [16,17] and Hasund [18-19].

Nevertheless, we couldn’t find such direct logical supposition regard of the correlation (weak one) between the Axial Condylar Angle and angular measurements determining the sagittal skeletal jaws relationship (SNA, ANB, ANB). This may support Todd’s contention [20] that “form does not slavishly follow function,” which Rickets also was in agree with [1].Once again, no previous researchers studied this exact correlation between the Axial Condylar Angle and angular measurements determining the sagittal skeletal jaws relationship (SNA, ANB, ANB) to compare with.

CONCLUSION :

Among orthodontically healthy and untreated skeletal class I adult male subjects with no history of temporomandibular joint disorders nor any clinical signs of it, the following conclusions can be mad out of the current study:

1. There is no significant relationship between the sagittal condylar angulation (∠ACA), and the cephalometric measurements that establishing the sagittal incisal interface morphology.
2. There is no significant relationship between the sagittal condylar angulation (∠ACA), and the cephalometric measurements that establishing the jaws skeletal relationship.
3. a kind of compensation process can be noted in the interrelationship between the axial condylar angle and both of angular and liner measurements that establishing the sagittal incisal interface morphology.

Clinical significance

Given the importance of the role of the sagittal condylar angulation in the morphology and growth of the craniofacial complex, this study tried toobviate the lack of information about the possible influence of the sagittal condylar position particularly with the sagital incisal interface.

Limitation of Study

The limitations of present study must be acknowledged because of the large individual variation of the malocclusions and the morphological characteristics depicted in these various types of malocclusions. Moreover, a three-dimensional analysis using CBCT can probably access of more accurately both mandibular condyles angulation and incisal interface morphology as compared to two-dimensional cephalometric analysis, and can be a future possibility of researches.

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