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Dentoskeletal Overjet Measurements of Iraqi Adult Sample with Different Skeletal Jaw Relationship

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ABSTRACT

Background: *Many attempts were done to develop a method that actually reflects the sagittal jaw discrepancies without depending on cranial landmarks or dental occlusion. This study aimed to use one of these methods (dentoskeletal overjet) for assessing the sagittal jaw relationships of Iraqi adult sample with different skeletal jaw relationship.* ***Materials and method:*** *The sample consisted of 90 digital true lateral cephalometric radiographs of Iraqi individuals with no previous orthodontic treatment. Cephalometric analysis of skeletal sagittal jaw relationship -ANB angle, beta angle and Wits appraisal- will perform for everyone to divide the sample into three groups (skeletal class I, II, III) for which the dentoskeletal overjet will be measured. All cephalometric measurements will be done using AutoCAD.* ***Results:*** *Descriptive statistics of all variables with different skeletal jaw relationship showed that mean values of dentoskeletal overjet were (1.15, 3.91 and –2.01 mm) for skeletal class I, class II and class III jaw relationship respectively. Accurate reproducibility of dentoskeletal overjet in assessment of jaw skeletal relationship showed that the lowest value was for assessment of skeletal class III jaw relationship (73%) and the value for assessment of both skeletal class I and class II was higher (93%).* ***Conclusions:*** *Dentoskeletal overjet could be utilized in accurate representation of skeletal jaw relationship.*

Keywords: Dentoskeletal overjet, Sagittal jaw relationship, Digital cephalometric analysis

INTRODUCTION

Since Broadbent [1] and Hofrath [2] introduced the cephalometer in 1931, cephalometric analysis has contributed to the analysis of malocclusion and it has become a standardized diagnostic method in orthodontic practice and research [2-4].

Many different cephalometric analyses developed to assess the sagittal jaw relationship some of them based on angular measurements like ANB angle and beta angle while the other based on linear measurements like Wits appraisal [5-7].

These methods are widely used among orthodontists, however; they have drawbacks and many authors reported controversies upon using them. Measurements of ANB angle are sensitive and may give false results beside it depends on the position of anterior cranial base that may affect the actual relationship [8-10]. The Wits appraisal (the distance between perpendiculars drawn from the occlusal plane to Points A and B) was introduced by Jacobson to overcome problems of the ANB angle by eliminating the cranial reference points and used occlusal plane as a reference base but a study done by Sherman showed that the value of wits appraisal doesn't remain stable throughout life [11].

Baik and Ververidou in 2004 reported a new measurement 'the beta angle' that does not depend on any cranial landmarks or dental occlusion for assessing sagittal jaw relationship [6].

Many attempts were done after that to develop a method that actually reflects the sagittal jaw discrepancies without depending on cranial landmarks or dental occlusion. In 2011, Al-Hammadi develop a method named it "dentoskeletal overjet".

The method depends on the dentoalveolar compensation for underlying skeletal base relation; and the overjet that remains due to incomplete dentoalveolar compensation as a result of large skeletal discrepancy [13].

This study formulated to find the applicability and reproducibility of this method for assessing the sagittal jaw relationship for Iraqi adult's sample.

MATERIALS AND METHODS

Sample

The sample consisted of 90 digital true lateral cephalometric radiographs of some undergraduate and postgraduate students in the College of Dentistry, University of Baghdad, Iraq.

Inclusion criteria

The following points consider in the selection of subjects:

1. A clinically harmonious and symmetrical face.
2. Full set of permanent teeth excluding third permanent molar.
3. No supernumerary teeth.
4. No previous orthodontic treatment.
5. No history of facial trauma or congenital malformation.
6. No septal deviation.

Exclusion criteria

The following points consider in the exclusion of subjects from the sample:

1. Previously had orthodontic treatment.
2. Previously had extraction of one or more teeth.
3. Artefact in the image of lateral cephalometric radiograph.

Sample grouping

The sample will be divided into three group according to sagittal jaw relationship (class I, II, and III) by measuring ANB angle, beta angle and wits appraisal for each digital true lateral cephalometric radiograph. Agreement of these methods will be considered for classifying the sample. In case of disagreement with at least one of those methods the digital true lateral cephalometric radiograph will be excluded.

Equipment

- Pentium IV portable computer.
- Analyzing softwares (AutoCAD 2007 by Autodesk, Inc.).

Method

Cephalometric analysis

Every digital true lateral cephalometric radiograph will be taken by PLANMICA PROMAX with DIMAX 3 Digital X-Ray Unit System Machine (FIN-00880, Helsinki, Finland (Figure 1).

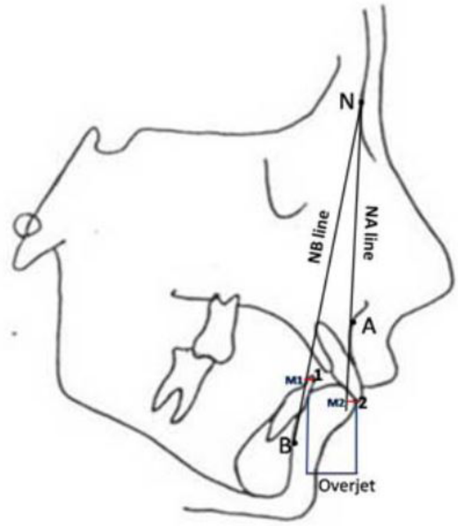

Figure 1 Diagrammatic representation of dentoskeletal overjet method

After importing the picture to program, the magnification was corrected, the points were localized, the planes were determined, and the angles and distances were measured by the AutoCAD program.

Landmarks identification and measurements procedures

I. Cephalometric landmarks

1) **Point N (Nasion):** The most anterior point on the nasofrontal suture in the median plane [14].
2) **Point A (Subspinale):** The deepest midline point on the premaxilla between the Anterior Nasal Spine and Prosthion [15].
3) **Point B (Supramentale):** The deepest midline point on the mandible between Infradentale and Pogonion [15].
4) **Point AO:** Intersection between occlusal plane and a straight passing through point A perpendicular on occlusal plane [11].
5) **Point BO:** Intersection between occlusal plane and a straight passing through point B perpendicular on occlusal plane [11].
6) **Point C:** The center of the condyle [6].
7) **Point 1 (Incisolabial line angle):** The junction between the labial surface and incisal edge of the most prominent lower central incisor [13].
8) **Point 2 (Incisopalatal line angle):** The junction between the palatal surface and incisal edge of the most prominent upper central incisor [13].

II. Cephalometric planes

1) **N-A line:** Formed by a line joining Nasion and point A [15].
2) **N-B line:** Formed by a line joining Nasion and point B [15].
3) **Occlusal plane:** Straight line passing through the intercuspation of the first premolar and the first molar [11].
4) **C-B line:** Line connecting the center of the condyle C with B point [6].
5) **A-B line:** Line connecting A and B points [6].
6) Line from point A perpendicular to the C-B line [6].

III. Cephalometric measurements

1) **ANB angle:** The angle between lines NA and N-B [5].
2) **Wits appraisal:** The horizontal distance between point AO and point BO [11].
3) **Beta angle:** Measured between the perpendicular line (dropped from point A to the C-B line) and the A-**B line [6].**
4) **NB-Point 1 (1st measurement):** The horizontal distance between (point 1) and the conventional NB line [13].
5) **NA-point 2 (2nd measurement):** The horizontal distance between (point 2) and the conventional NA line [13].
6) **Overjet:** Distance between (point 1) and (point 2) in a tangent way to both [13].
7) Dentoskeletal overjet (Final measurement) = (1st measurement) + (Overjet) - (2nd measurement) [13].

Statistical analyses

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**
   a) Means.
   b) Standard deviations (SD).
   c) Statistical tables.
   d) Cross tabulation and frequencies.

Inferential statistics

a) Binary logistic regression to estimate the probability of dentoskeletal overjet measurements for assessing the sagittal jaw relationship.

In the statistical evaluation, the following levels of significance are used:

$^{\#}$P>0.05: Non-significant; 0.05≥P>0.01* Significant; 0.01≥P>0.001** Highly significant; P≤0.001*** Very highly significant.

RESULTS AND DISCUSSION

Descriptive statistics of all variables with different skeletal jaw relationship showed that mean values of dentoskeletal overjet were (1.15, 3.91 and –2.01 mm) for skeletal class I, class II and class III jaw relationship respectively (Table 1).

Table 1 Descriptive statistics of variables with different skeletal jaw relationship

Variables	Group	N	Minimum	Maximum	Mean	Std. Deviation
ANB angle	Class I	30	2	4	2.8667	0.81931
	Class II	30	5	9	6.2	1.09545
	Class III	30	-3	1	-0.2	1.18613
Beta angle	Class I	30	28	33	29.8	1.39951
	Class II	30	23	28	25.6667	1.42232
	Class III	30	32	38	34.2	1.47157
Wits Appraisal	Class I	30	-0.3	0.1	-0.0933	0.12015
	Class II	30	0	0.8	0.36	0.23723
	Class III	30	-0.6	0	-0.1767	0.1775
dentoskeletal overjet	Class I	30	-1.3	2.6	1.15	0.81864
	Class II	30	2.3	6.1	3.91	1.02968
	Class III	30	-7	1	-2.0167	1.96733

The measurements of this study come in agreement with Al-Hammadi as he reported in 2011 that the value of dentoskeletal overjet for skeletal class I jaw relationship was (–1 to 2.5 mm) and for skeletal Class II it was larger than 2.5 mm) and skeletal Class III was less than (–1 mm).

Accurate reproducibility of dentoskeletal overjet in assessment of jaw skeletal relationship is shown in Table 2. The lowest value was for assessment of skeletal class III jaw relationship (73%) and the value for assessment of both skeletal class I and class II was higher (93%). The lowest value for assessment of skeletal class III jaw relationship not necessarily mean that dentoskeletal overjet is not accurate for assessing skeletal class III.

Table 2 Cross tabulation of accuracy of dentoskeletal overjet in assessment of skeletal jaw relationship

Group	Count	Accurate assessment	
		False	True
Class I	Count	2	28
	% within group	6.70%	93.30%
Class II	Count	2	28
	% within group	6.70%	93.30%
Class III	Count	8	22
	% within group	26.70%	73.30%
Total	Count	12	78
	% within group	13.30%	86.70%

Binary logistic regression statistical test showed that p value of skeletal class I and class II in comparison with class III was (0.053) that mean the probability of dentoskeletal overjet in accurate assessment of skeletal class I and class II was not significantly differ ($p>0.05$) from that of class III as shown in Table 3.

Table 3 Binary logistic regression test

Group	B	S.E.	Wald	df	P value	Exp (B)	95.0% C.I. for EXP (B)	
							Lower	Upper
Group	-	-	6.043	2	0.049 *	-	-	-
Class I	1.627	0.84	3.751	1	0.053 #	5.091	0.981	26.43
Class II	1.627	0.84	3.751	1	0.053 #	5.091	0.981	26.43
Constant	1.012	0.413	6.004	1	0.014	2.75	-	-

Chi-square test (Table 4) showed that p-value was (0.031) that mean there is significant relationship between skeletal overjet and accurate assessment of skeletal jaw relationship ($p<0.05$).

Table 4 Chi-square tests

Variables	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.923	2	0.031
Likelihood Ratio	6.495	2	0.039
No. of Valid Cases	90	-	-

CONCLUSION

Dentoskeletal overjet could be utilized in accurate representation of skeletal jaw relationship.

DECLARATIONS

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Conflict of Interest

There are no known conflicts of interest, financial or otherwise for any of the authors of this manuscript which would interfere with the integrity of this research.

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