Original Article

Anteroposterior and Vertical Components of Class II division 1 and division 2 Malocclusion

Emad A. A. Al-Khateeb[a]; Susan N. Al-Khateeb[b]

ABSTRACT

Objective: To describe and analyze the skeletal and dental characteristics associated with Class II division 1 (Class II/1) and Class II division 2 (Class II/2) malocclusions in the anteroposterior and vertical dimensions.

Materials and Methods: A total of 551 lateral cephalograms were used; 293 films of Class II/1 and 258 films of Class II/2 malocclusions. Lateral cephalographs were traced and analyzed. Parameters for both malocclusions were compared with each other and with the norms calculated for the Jordanian population in another study.

Results: The maxilla was prognathic in both malocclusions. The mandible was retrognathic in Class II/1 and orthognathic in Class II/2. Vertically, LAFH was significantly reduced in patients with Class II/2 compared with subjects with Class II/1 who exhibited a significantly increased LAFH. In Class II/1, the lower incisors were proclined and the interincisal angle was reduced, while in Class II/2 the lower incisors were at a normal inclination and the interincisal angle was significantly increased.

Conclusions: Class II/2 may be considered as a separate entity which differs in almost all skeletal and dental features from Class I and Class II/1. A Class II skeletal pattern and reduced interincisal angle were common features of Class II/1 malocclusion, while a Class II skeletal pattern, increased interincisal angle, and skeletal deep bite were common features of Class II/2 malocclusion. (*Angle Orthod.* 2009;79:859–866.)

KEY WORDS: Class II division 1; Class II division 2

INTRODUCTION

The dentoskeletal morphology of Class II malocclusion has been analyzed in a number of cephalometric investigations.[1–5] The value of these studies is limited, however, by several factors, including lack of a clear definition of Class II malocclusion; the demarcation between Class II and Class I, especially in the mixed dentition, is vague.[3] Secondly, differentiation between Class II division 1 (Class II/1) and Class II division 2 (Class II/2) malocclusions was not fully addressed.[3,6] Additionally, most of the studies had insufficient sample size. This is especially true when evaluating Class II/2 malocclusions.[4]

Some studies found that the maxilla in Class II/1 patients was more protrusive, and the mandible was normal in size and position.[6] Other studies found that the maxilla was in a normal position in relation to the cranial base while the mandible was retrusive.[1–3] Others found that the Class II skeletal pattern in Class II/1 patients is due to both maxillary protrusion and mandibular retrusion.[4,7]

In Class II/2 malocclusion, most of the studies found that the maxillary anteroposterior position is similar to that in Class I or Class II/1 subjects.[8–10] Few studies indicated a more prognathic position of the maxilla,[11,12] while Ballard[13] reported a retrognathic maxilla.

The Class II/1 incisal relationship was found in association with a range of vertical skeletal patterns.[4,7] Some studies reported an increased lower facial height,[14,15] while other studies found that the lower fa-

[c] Master's student, Department of Orthodontics, Faculty of Dentistry, Jordan University of Science and Technology, Irbid, Jordan.

[b] Associate Professor, Department of Orthodontics, Faculty of Dentistry, Jordan University of Science and Technology, Irbid, Jordan.

Corresponding author: Dr Susan Al-Khateeb, Associate Professor, Department of Orthodontics, Faculty of Dentistry, Jordan University of Science and Technology, PO Box 3030, 22110 Irbid, Jordan
(e-mail: susank@just.edu.jo)

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Table 1. Age and Gender Distribution of the Investigated Sample

	n	Mean, Years	SD	Age Range, Years
Class II, division 1				
Female	156	16.1	1.7	11.0–29.0
Male	137	16.5	1.8	11.5–28.0
Total	293	16.3	1.8	11.0–29.0
Class II, division 2				
Female	148	16.2	1.6	10.5–32.0
Male	110	15.8	1.9	12.0–27.0
Total	258	15.9	1.8	10.5–32.0

cial height was significantly reduced.[4,11] Class II/2 malocclusion is usually associated with an increased posterior facial height,[16,17] a reduced mandibular plane angle,[9,12,14] a reduced anterior facial height, and a more horizontal growth vector.[13,14,18]

This retrospective study was conducted to investigate the anteroposterior and vertical components of Class II/1 and Class II/2 malocclusions in a Jordanian population sample using lateral cephalograms to compare the two groups together. The distribution of individuals within each of the cephalometric variables in Class II/1 and Class II/2 was compared with the normal values of the Jordanian population.

MATERIALS AND METHODS

Five hundred fifty-one lateral cephalograms were collected from the orthodontic department at the Dental Teaching Center of Jordan University of Science and Technology and from two private practices. From the total of the lateral cephalograms, 293 radiographs were for patients with Class II/1 malocclusion and 258 films were for patients with Class II/2 malocclusion. All subjects were diagnosed clinically as having Class II/1 or Class II/2 malocclusion, according to the British Standards Institute Classification of malocclusion.[19] (Class II/1 and Class II/2 malocclusions are defined as: the incisal relationship in which the lower incisor edges lie posterior to the cingulum plateau of the upper central incisors with the upper incisors being proclined or retroclined, respectively).

Patients' records and study casts were checked, all selected subjects were healthy Jordanians, had no history of orthodontic treatment, no crowns or bridges, and no previous extractions. They all had full sets of permanent dentition. Age and gender distributions of the subjects are summarized in Table 1.

The cephalographs were divided into two groups; Class II/1 as group 1 and Class II/2 as group 2. To avoid the effect of magnification of different x-ray machines, only angular and proportional measurements were considered. Cephalometric landmarks were marked on each cephalogram by the same investigator in a darkened room in random order. Twenty landmarks were identified (Figure 1).

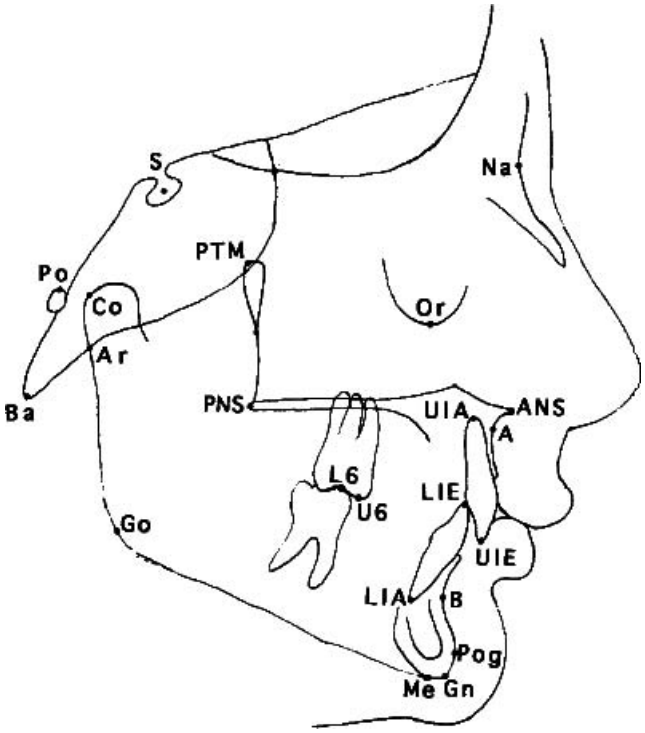

Figure 1. Cephalometric landmarks: sella (S), nasion (N), A point, B point, anterior nasal spine (ANS), posterior nasal spine (PNS), pogonion (Pog), gnathion (Gn), menton (Me), gonion (Go), articulare (Ar), condylon (Co), basion (Ba), porion (Po), ptergomaxillary fissure (PTM), orbitale (Or), upper incisor apex (UIA), upper incisor crown tip (UIE), lower incisor apex (LIA), and lower incisor crown tip (LIE).

The lateral cephalometric films were scanned (HP Scanjet G4050, Hewlett-Packard Company, Palo Alto, Calif) and traced by the same investigator using Vistadent AT software (GAC International Inc, Bohemia, NY). After digitizing the cephalometric landmarks, all cephalometric parameters were measured by the software (Figure 2a,b).

The patients were further divided into two subgroups within each malocclusion group according to age: below 14 years of age and above 14 years. Ninety-two subjects (31.4%). Ninety-two subjects (31.4%) in group 1, and 111 subjects (43%) in group 2 were below 14 years of age.

Statistical Analysis

The mean and standard deviation for each variable were calculated using the Statistical Package for Social Sciences (SPSS, Version 15.0 Inc, Chicago, Ill) for Windows. Comparisons between group 1 and group 2 for all measured parameters were made using independent Student's *t*-test. Within each group of malocclusion, the effect of gender and age was evaluated by using independent *t*-test.

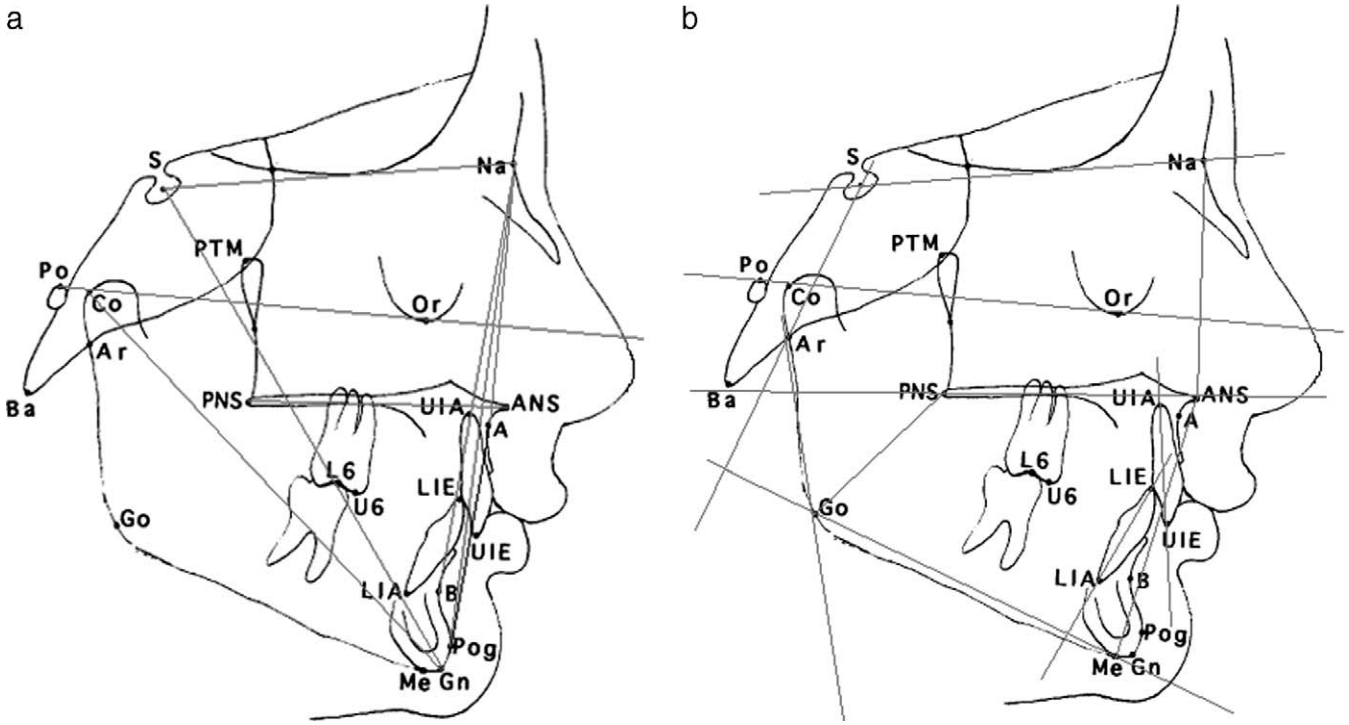

Figure 2. Cephalometric parameters: (a) anteroposterior variables: SNA, SNB, ANB, SNPog, facial angle, angle of convexity, Y-axis angle; (b) vertical variables: lower anterior facial height ratio, posterior anterior facial height ratio, gonial angle, SN-mandibular plane angle, MM angle; (c) dentoskeletal and dental variables: Li-Mp, Ui-Max, interincisal angle, saddle angle.

The means of the variables (SNA, SNB, ANB, MM, and interincisal angles) were then compared by independent *t*-test with the norms for the Jordanian population published by Hamdan and Rock.[20] The distribution of subjects was counted in each of the main anteroposterior and vertical parameters. The percentages of the subjects within normal limits and above and below one standard deviation were calculated.

Method Error

To determine the method error in the present study, 30 films were retraced by the same examiner after 1 month. The method error was calculated using Dahlberg's[21] double determination formula. Results are summarized in Table 2. The error ranged from 0.54° to 1.28°.

RESULTS

Differences Between Male and Female Subjects

The mean and standard deviation of each variable for male and female subjects were calculated in each group (Table 3). No statistically significant differences were found between male and female subjects in the two groups except for Li-Mand in group 1. Lower incisors were more proclined in male than in female subjects ($P < .05$). Since no differences were found between male and female subjects in most variables, the data for male and female subjects were pooled together.

Differences Between Age Groups

The mean and standard deviation of each variable for the two age subgroups within each malocclusion are shown in Table 4. Significant differences were found between the two age subgroups in Class II/1 regarding the SNB and facial angles. Both angles were

Table 2. Method Error

Variable	Method Error
SNA (°)	0.72
SNB (°)	0.54
ANB (°)	0.71
SNPog (°)	0.85
Facial angle (°)	0.77
Facial convexity (°)	0.77
Y-axis (°)	0.99
LAFH ratio (%)	1.03
Posterior/anterior FH ratio (%)	1.11
FM angle (°)	0.80
Gonial angle (°)	1.28
SN-mandibular plane (°)	0.86
MM angle (°)	0.71
Saddle angle (°)	0.95
Li-Mand (°)	0.73
Ui-Max (°)	0.99
Interincisal angle (°)	1.13

Table 3. Mean and Standard Deviation of All Variables for Male and Female Subjects and the Total in Each Group

Variable	Class II Division 1			Class II Division 2		
	Male	Female	Total	Male	Female	Total
SNA (°)	82.1 ± 3.6	81.9 ± 3.3	82.1 ± 3.4	82.2 ± 4.5	82.7 ± 3.5	82.5 ± 3.9
SNB (°)	76.0 ± 2.9	75.7 ± 2.8	75.9 ± 2.9	76.7 ± 3.6	77.1 ± 3.0	77.0 ± 3.3
ANB (°)	6.2 ± 1.9	6.2 ± 1.8	6.2 ± 1.8	5.6 ± 2.0	5.6 ± 2.0	5.6 ± 2.0
SNPog (°)	76.3 ± 3.2	76.0 ± 2.9	76.2 ± 3.0	78.8 ± 4.1	83.6 ± 6.7	81.6 ± 4.6
Facial angle (°)	84.9 ± 3.0	84.4 ± 6.2	84.6 ± 4.9	85.3 ± 3.4	85.5 ± 3.5	85.4 ± 3.4
Facial convexity (°)	11.9 ± 4.9	12.0 ± 4.5	12.0 ± 4.7	8.8 ± 4.9	9.5 ± 4.5	9.2 ± 4.7
Y-axis (°)	61.2 ± 4.5	61.7 ± 6.0	61.4 ± 5.4	60.1 ± 4.4	59.8 ± 4.4	60.1 ± 4.4
LAFH ratio (%)	56.5 ± 4.2	56.7 ± 4.6	56.6 ± 4.4	55.6 ± 4.6	54.3 ± 6.5	54.9 ± 5.8
Posterior/anterior FH ratio (%)	62.0 ± 4.0	62.0 ± 4.0	62.0 ± 4.0	68.0 ± 7.0	67.0 ± 5.0	68.0 ± 6.0
FM angle (°)	25.9 ± 4.6	25.9 ± 4.8	25.9 ± 4.7	21.5 ± 4.9	23.1 ± 7.6	22.3 ± 6.3
Gonial angle (°)	124.8 ± 6.3	125.0 ± 8.6	124.9 ± 7.6	118.3 ± 7.6	118.3 ± 7.7	118.3 ± 7.6
SN-mandibular plane (°)	33.5 ± 6.1	34.0 ± 5.5	33.8 ± 5.8	27.6 ± 5.3	28.3 ± 5.6	28.0 ± 5.5
MM angle (°)	27.3 ± 4.6	27.5 ± 4.6	27.4 ± 4.6	21.3 ± 4.1	21.9 ± 4.7	21.7 ± 4.4
Saddle angle (°)	125.0 ± 6.4	125.3 ± 5.8	125.2 ± 6.1	122.0 ± 7.7	120.4 ± 11.4	121.1 ± 10.0
Li-Mand (°)	102.4 ± 9.7*	99.5 ± 9.7*	100.9 ± 9.8	94.8 ± 8.3	95.0 ± 7.1	94.9 ± 7.6
Ui-Max (°)	118.1 ± 5.4	117.5 ± 5.5	117.8 ± 5.5	98.5 ± 6.1	98.7 ± 5.5	98.6 ± 5.8
Interincisal angle (°)	114.9 ± 8.6	116.1 ± 13.4	115.5 ± 11.4	142.4 ± 14.3	143.7 ± 9.1	143.2 ± 11.6

* Significant difference between male and female subjects; $P < .05$.

larger in the younger group ($P < .05$). In the Class II/2 group, no significant differences were found.

Differences Between Class II (Division 1 and 2) and Normal Values of Jordanians (Class I)

The mean and standard deviation for cephalometric variables of Class I occlusion, as reported by Hamdan and Rock,[20] for group 1 and group 2 are shown in Table 5. The significant differences between the two groups and Class I are noted in the table.

The SNA, ANB, MM, and Li-Mp angles in group 1 were significantly larger when compared with Class I occlusion, while the SNB angle was significantly smaller ($P < .05$). In group 2, the SNA, ANB, and interincisal angles were significantly larger when compared with Class I occlusion ($P < .05$). The MM angle was significantly smaller in group 2 ($P < .05$). No significant difference was found between the data published for Class I and group 2 for the SNB angle.

The Distribution of Individuals Within Each Variable in Group 1 and Group 2

The percentages of subjects in the Class II/1 and Class II/2 groups within the normal range and those

Table 4. Mean and Standard Deviation for Each Measurement in the Age Subgroups in Class II/1 and Class II/2

Variable	Class II/1 (Mean ± SD)		Class II/2 (Mean ± SD)	
	Age ≤14 y N = 92	Age >14 y N = 201	Age ≤14 y N = 111	Age >14 y N = 147
SNA (°)	82.5 ± 3.4	81.9 ± 3.4	82.9 ± 3.4	82.2 ± 4.2
SNB (°)	76.4 ± 3.0*	75.6 ± 2.8*	76.5 ± 7.4	76.9 ± 3.3
ANB (°)	6.0 ± 1.8	6.3 ± 1.8	5.7 ± 1.8	5.6 ± 2.1
SNPog (°)	76.7 ± 3.2*	75.9 ± 2.9*	78.2 ± 3.9	78.9 ± 3.7
Facial angle (°)	84.3 ± 7.1	84.8 ± 3.4	85.4 ± 3.3	85.3 ± 3.6
Facial convexity (°)	11.8 ± 4.7	12.1 ± 4.7	9.4 ± 4.7	9.0 ± 4.6
Y-axis (°)	61.9 ± 6.4	61.2 ± 4.8	59.9 ± 4.0	60.3 ± 4.7
LAFH ratio (%)	56.9 ± 4.2	56.9 ± 4.2	54.3 ± 7.0	55.4 ± 4.7
Posterior/anterior FH ratio (%)	62.1 ± 4.6	62.0 ± 4.4	67.0 ± 6.6	68.0 ± 4.9
FM angle (°)	25.6 ± 4.7	26.0 ± 4.5	22.4 ± 5.1	22.3 ± 7.6
Gonial angle (°)	125.0 ± 9.8	124.9 ± 6.2	118.1 ± 8.0	118.3 ± 7.3
SN-mandibular plane (°)	33.1 ± 5.6	34.1 ± 5.8	28.3 ± 5.3	27.7 ± 5.6
MM angle (°)	27.4 ± 4.9	27.4 ± 4.4	21.9 ± 4.4	21.4 ± 4.5
Saddle angle (°)	124.7 ± 6.1*	125.4 ± 6.1*	121.4 ± 7.1	120.9 ± 11.9
Li-Mand (°)	101.6 ± 12.1	100.6 ± 8.4	95.0 ± 7.3	94.9 ± 8.0
Ui-Max (°)	117.5 ± 5.8	117.9 ± 5.3	98.2 ± 5.6	98.9 ± 5.9
Interincisal angle (°)	114.9 ± 13.9	115.8 ± 9.9	143.4 ± 9.2	143.1 ± 13.2

* $P < .05$, ** $P < .01$, *** $P \leq .001$.

Table 5. Comparisons Between Means (± Standard Deviation) of the Measured Variables in Class I (from Hamdan and Rock[20]) and Their Corresponding Variables in Class II/1 and Class II/2 Malocclusions (From This Study)

Variable	Class I n = 65	Class II Division 1 n = 293	Class II Division 2 n = 258
SNA (°)	80.7 ± 3.67	82.1 ± 3.4*	82.5 ± 3.9*
SNB (°)	77.7 ± 3.19	75.9 ± 2.9*	77.0 ± 3.3
ANB (°)	3.0 ± 1.96	6.2 ± 1.8*	5.6 ± 2.0*
MM angle (°)	25.5 ± 5.28	27.4 ± 4.6*	21.7 ± 4.4*
Li-Mand (°)	95.9 ± 5.06	100.9 ± 9.8*	94.9 ± 7.6
Interincisal angle (°)	127.5 ± 7.93	115.5 ± 11.4*	143.2 ± 11.6*

* $P < .05$.

above the norm plus one standard deviation and those below the norm minus one standard deviation are shown in Table 6, Figure 3 and Table 7, Figure 4, respectively. Of the subjects, 80% and 75.6% had a Class II skeletal pattern in Class II/1 and Class II/2, respectively.

Comparison Between Group 1 and Group 2

The mean and standard deviation of all the variables measured in Class II/1 and Class II/2 are shown in Table 8. Except for the SNA angle, significant differences were found in all investigated angular measurements between the two groups. The *P* values are shown in Table 8 for all variables.

DISCUSSION

In this study, it was intended to investigate the skeletal and dentoskeletal features of Class II/1 and Class II/2 malocclusions in both genders in a sample of the Jordanian population. The large sample used in this study forced a wide age range (included growing subjects) which necessitated splitting the sample into two age groups. The SNB and facial angles were smaller in the older group in Class II/1. Although small differences existed, they were statistically significant. This

Table 6. Distribution of Individuals Within Each Variable in the Class II/1 Group

Variable	Class 1 Value ± SD (from Hamdan and Rock[20])	Subjects Within the Range of 1 SD, %	Subjects Above 1 SD, %	Subjects Below 1 SD, %
SNA (°)	80.7 ± 3.67	65.8	24.6	9.6
SNB (°)	77.7 ± 3.19	61.1	6.1	32.8
ANB (°)	3.0 ± 1.96	19.0	81.0	—
MM angle (°)	25.5 ± 5.28	71.7	21.5	6.8
Li-Mand (°)	95.9 ± 5.06	48.9	47.1	4.0
Interincisal angle (°)	127.5 ± 7.93	30.3	3.8	65.9

Table 7. Distribution of Individuals Within Each Variable in the Class II/2 Group

Variable	Class 1 Values ± SD (from Hamdan and Rock[20])	Subjects Within the Range of 1 SD, %	Subjects Above 1 SD, %	Subjects Below 1 SD, %
SNA (°)	80.7 ± 3.67	69.8	26.7	3.5
SNB (°)	77.7 ± 3.19	65.5	12.0	22.5
ANB (°)	3.0 ± 1.96	24.0	75.6	—
MM angle (°)	25.5 ± 5.28	56.6	5.0	38.4
Li-Mand (°)	95.9 ± 5.06	44.9	22.9	32.2
Interincisal angle (°)	127.5 ± 7.93	21.0	77.9	—

result was in agreement with Dibbets[22] and Kerr and Hirst[23] who stated that differences in mandibular size between Angle classes emerge later during development and become more defined in adult samples.

Several cephalometric parameters describing Class II/1 and Class II/2 were compared with the Jordanian norms published by Hamdan and Rock[20]; variables that were not reported were not further elaborated. A wider age range was used in our study than that of Hamdan and Rock. Since no other data were published on Jordanians and, since a few differences were found in our study between different age groups, the comparison was made nevertheless.

Differences Between Class II (Division 1 and 2) and Class I Anteroposterior Skeletal Parameters

No significant difference was found between the two malocclusions in SNA. The mean of the SNA angle in group 1 and group 2 was significantly increased, indicating a prognathic maxilla in both groups. When the distribution of subjects was calculated, about two thirds of the subjects were within the normal range of SNA, and one quarter had the SNA angle greater than one standard deviation in both groups indicating a prognathic maxilla. Only few subjects had a decreased SNA angle reflecting a retrognathic maxilla. The frequency of retruded maxilla in Class II/1 was slightly higher than that in Class II/2.

A number of previous studies reported that maxillary protrusion is a dominant feature of Class II malocclusion,[4,16] while some studies reported a normal position of the maxilla.[24]

The mean of the SNB angle for the Class II/1 group was significantly less than that for Class I and Class II/2 indicating a retrognathic mandible in group 1. Group 2 exhibited a normal position of the mandible. A higher frequency of subjects with mandibular retrognathism was found in group 1 than in group 2.

Previous studies[1,5] indicated that mandibular retrusion is a common characteristic of Class II/1. In Class II/2 the mean SNB angle was normal. This finding was

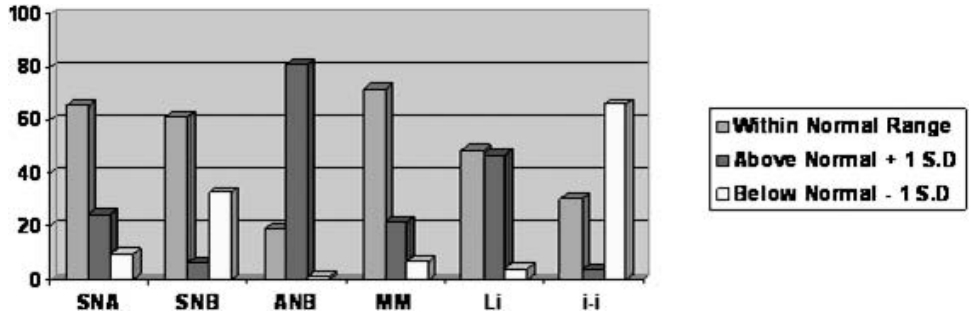

Figure 3. The distribution of individuals within each variable studied in the Class II division 1 group.

in disagreement with some previous studies[4,16,24] that indicated a retrognathic mandible in Class II/2 malocclusion.

The mean ANB angle for group 1 and group 2 was significantly increased compared with Class I, indicating a Class II skeletal pattern. Although the ANB angle was significantly larger in group 1 than in group 2, the difference between the two groups was smaller than the error of measurement rendering this difference less reliable.

The majority of patients in both groups had a Class II skeletal pattern. Several studies have reported a Class II skeletal pattern in patients with a Class II incisor relationship.[14,25]

The chin was more prominent in group 2 compared with group 1 as indicated by the SNPog angle, a finding which was reported by several studies.[4,15] The chin prominence might be attributed to the more prognathic mandible in Class II/2 or to a normal development of the base of mandible which is not restrained by the effect of retroclined upper incisors.[26]

Both the facial angle and the Y-axis angle in group 2 were significantly lower than in group 1 indicating a more prognathic mandible in Class II/2 malocclusion.

Vertical Skeletal Parameters

The mean MM angle in Class II/1 was significantly increased with a wide range of vertical skeletal patterns. This finding was in agreement with several studies.[7,25,27]

In Class II/2, the MM angle was significantly reduced compared with Class I. More than 35% of individuals had a reduced MM angle. Previous studies reported that Class II/2 is usually associated with a reduced anterior facial height and a horizontal growth vector, which are indications of an anterior growth rotation and a skeletal deep bite in these individuals.[4,14,24]

When the other vertical parameters between group 1 and group 2 were compared, the posterior to anterior lower facial height ratio was significantly higher in the Class II/2 group compared with that of the Class II/1 group. A review of the literature reveals wide agreement with this finding.[14,16,17]

The gonial angle is highly correlated with the MM angle.[3] The results of our study were in agreement with Blair[11] who found a more acute gonial angle in Class II/2 in comparison with Class II/1, indicating a more flat mandibular plane in individuals with Class II/2.

The saddle angle was more obtuse in group 1 compared with group 2. A more obtuse angle may be indicative of a more severe Class II skeletal pattern.[28]

Dental Parameters

There is a general agreement in the literature on the dentoalveolar cephalometric characteristics of Class

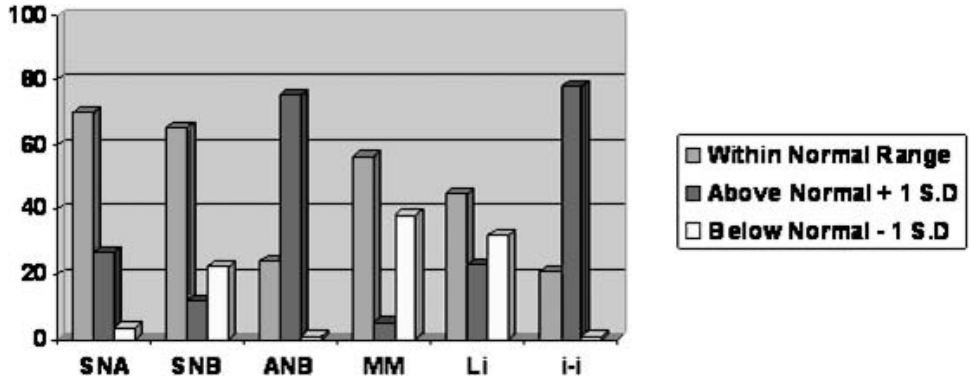

Figure 4. The distribution of individuals within each variable studied in the Class II division 2 group.

Table 8. Mean and Standard Deviation for Each Measurement in the Two Groups

Variable	Class II Division 1 (Mean ± SD)	Class II Division 2 (Mean ± SD)	Difference
SNA (°)	82.1 ± 3.4	82.5 ± 3.9	0.4
SNB (°)	75.9 ± 2.9	77.0 ± 3.3	1.1***
ANB (°)	6.2 ± 1.8	5.6 ± 2.0	0.6***
SNPog (°)	76.2 ± 3.0	81.2 ± 5.4	5.0
Facial angle (°)	84.6 ± 4.9	85.4 ± 3.4	0.8*
Facial convexity (°)	12.0 ± 4.7	9.2 ± 4.7	2.8***
Y-axis (°)	61.4 ± 5.4	60.1 ± 4.4	1.3**
LAFH ratio (%)	56.6 ± 4.4	54.9 ± 5.8	1.7***
Posterior/anterior FH ratio (%)	62.0 ± 4.0	68.0 ± 6.0	6.0***
FM angle (°)	25.9 ± 4.7	22.4 ± 6.6	3.5***
Gonial angle (°)	124.9 ± 7.6	118.3 ± 7.6	6.6***
SN-mandibular plane (°)	33.8 ± 5.8	28.0 ± 5.5	5.8***
MM angle (°)	27.4 ± 4.6	21.7 ± 4.4	5.7***
Saddle angle (°)	125.2 ± 6.1	121.1 ± 10.0	4.1***
Li-Mand (°)	100.9 ± 9.8	94.9 ± 7.6	6.0***
Ui-Max (°)	117.8 ± 5.5	98.6 ± 5.8	19.2***
Interincisal angle (°)	115.5 ± 11.4	143.2 ± 11.6	27.7***

* $P < .05$, ** $P < .01$, *** $P \leq .001$.

II/1 and II/2 malocclusions. As expected, and according to the definitions and Angle's original description[29] of Class II/2 malocclusion, compared to Class II/1, the upper incisors are more retroclined in Class II/2.

The lower incisors were proclined in group 1. A high percentage of subjects (47%) had proclined lower incisors. The incisor proclination might be attributed to dentoalveolar compensation in response to mandibular retrusion.[30,31] On the other hand, a few previous studies reported a normal inclination[7] of the mandibular incisors in Class II/1.

In Class II/2, the lower incisors exhibited a normal inclination to the mandibular plane. Some studies reported similar results.[4] A high percentage (45%) of individuals in the Class II/2 group had a normal inclination of lower incisors to the mandibular plane, about one third of subjects had them retroclined, and less than one quarter of them had proclined lower incisors.

The interincisal angle was significantly increased in most of the subjects in the Class II/2 group. This is in agreement with previous studies which described an obtuse interincisal angle in Class II/2 individuals due to the retroclined upper incisors.[8,10,13]

In Class II/1, the interincisal angle was significantly reduced in most of the subjects due to the proclined upper and lower incisors in this malocclusion, a finding that agrees with previous studies.[32]

All results in this study that contradict results of some previous studies might be attributed to ethnic background, age, and size of the studied sample or due to the use of different reference lines.

CONCLUSIONS

- Class II/1 and Class II/2 can occur with a variety of skeletal and dental components in the anteroposterior and vertical dimensions.
- Class II/2 differs in almost all of the cephalometric features from Class II/1 in the anteroposterior and vertical dimensions.
- Class II/2 should be considered as a separate entity, which differs in almost all of its skeletal and dental features from Class I and Class II/1.
- Class II skeletal pattern and reduced interincisal angle were common features of Class II/1 malocclusion while Class II skeletal pattern, increased interincisal angle, and skeletal deep bite were common features of Class II/2 malocclusion.

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