ORIGINAL ARTICLE

Comparison of cephalometric characteristics of class II division 1 patients between Shiraz and Hamadan

Vahid Molabashi
Assistant professor, Orthodontic department, School of Dentistry, Hamadan University of Medical sciences
Zohreh Hedayati
Associate professor of Orthodontics, School of Dentistry, Shiraz University of Medical sciences
Amirfarhang Miresmaeili
Associate professor of Orthodontics, School of Dentistry, Hamadan University of Medical Sciences
Farhad Kashi
Dentist
Maryam Dinparvar
Postgraduate student, Orthodontic Department, School of Dentistry, Hamadan University of Medical Sciences

Background and aim: Accurate identification of dental and skeletal characteristics of different kinds of malocclusions is necessary for educational purposes, proper treatment planning and to reach successful results. The aim of this study was to assess skeletal and dental differences of class II division I patients in Shiraz and Hamadan Dental Schools.

Method: In this retrospective study lateral cephalograms of 98 patients from Hamadan (53 girls and 45 boys) and 96 Patients from Shiraz (48 girls and 48 boys) with class II division I malocclusion and age range of 9-14 years old were evaluated. Cephalograms with ANB angle higher than 5 degree were traced with Dolphin program. Statistical analysis was performed using SPSS software. Student t- test was used for between group comparisons. Chi- Square tests used for dichotomous variables.

Results: Comparison of mean values of variables between the two groups showed significant differences between SNB, MP-SN, U1-NA0,Y-Axis, Inter incisal angle and PFH/AFH. High percent of patients in both groups had mandibular retrusion, vertical facial growth pattern, protrusion of upper and lower anterior teeth. These characteristics were not statistically significant between boys and girls.

Conclusion: This study revealed that there was more mandibular retrusion, vertical facial growth and maxillary protruded incisors in class II division I patients of Hamadan in comparison to Shiraz.

Key words: Malocclusion, Angle class

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Corresponding author: Maryam Dinparvar Postgraduate student, Orthodontic Department, School of Dentistry, Hamadan University of Medical Sciences

INTRODUCTION

It is essential to know the descriptive characteristics of different types of malocclusions and their dental and skeletal structures in order to produce an appropriate treatment plan with suitable treatment mechanics and retention regime(1). The Class II malocclusion is a common malocclusion with a prevalence ranging between 5% and 29%(2).

Although Class II malocclusion is not the most common malocclusion, because of esthetic problems, patients with Class II malocclusion are seeking orthodontic treatment more than other patients.

As with any morphologic features, genetic differences might be expected to account for variations among individuals(3). Some reports have indicated that the maxilla in Class II division 1 patients was more protrusive and the mandible was normal in size and position (4). Other studies found that the maxilla was in a normal position in relation to the cranial base while the mandible was retrusive (5,6). Others found that Class II skeletal pattern is due to both maxillary protrusion and mandibular retrusion (4,7-9). It seems the ethnic backgrounds of the samples were used in these studies have played a role in determining the craniofacial characteristics of the Class II pattern(2). Ono et al.(1986) reported that both the maxilla and mandible of Japanese were located more posterior than those of Americans, with the Japanese exhibiting greater vertical development(10). Ishii (2002) noted that Japanese class II division I patients had a relatively shorter and more posterior positioned maxilla, and greater backward rotation of the mandible compared with Caucasian ones(11). Bishara (1998) reported that the presence of greater skeletal facial convexity in the untreated Class II/1 subjects, accompanied by a tendency for a more retruded mandible (12). The results of a study in Mashhad university indicated that most of patients with class II division 1 have Orthognathic maxilla, Retrognathic mandible, proclined upper incisors and normal lower incisors(13). Karlsen (1994) evaluate the craniofacial morphology in Class II division 1 children with and without a deep bite, and the results showed that an anterior mandibular growth rotation occurred especially in subjects with a lack of incisor support(14). Moorrees (1969) used study casts to evaluate arch dimensions of untreated Class II division 1 and concluded that in the Class II division 1 group the inter canine and inter molar distances were found to be smaller than average(15). The complex etiology and great variety of morphologic and functional aspects of this malocclusion motivate some studies to obtain a more

accurate diagnosis and to allow appropriate and compatible treatment for the different types of Class II division 1 malocclusion(4,16,17).

Determination of the most common features of Class II division 1 malocclusion can be useful for strategic planning for prevention and treatment of growing patients. Therefore, the aim of this study was to compare the skeletal and dental characteristics of patients with Class II division 1 malocclusion in Shiraz and Hamadan dental schools.

METHOD

In this retrospective study lateral cephalograms of 98 Patients from Hamadan (53 girls and 45 boys) and 96 Patients from Shiraz (48 girls and 48 boys) with class II division I malocclusion and age range of 9-14 years old were evaluated. All subjects had an ANB angle higher than 5 degrees on an angle class II molar relationship. Cephalograms were traced by one investigator using Dolphin Imaging Software.

16 angular and linear measurements were calculated to evaluate skeletal and dental relationship of maxilla and mandible, cranial base, and vertical dimensions. These parameters include:

SN, SNA, SNB, ANB, MP-SN, Anterior Face Height, Posterior Face Height, P/A face height, Y-axis, U1- SN, U1- NA (mm), U1- NA (degree), IMPA, L1- NB(mm), L1-NB(Degree), and inter incisal angle.

The mean and standard deviation of each variable was computed and compared between two groups.

Then frequency and features of different types of class II/ div 1 malocclusion were evaluated in each city and compared with each other.

To evaluate the reliability of these measurements, 20 cephalograms were traced two weeks later and intra-class correlation was used to test the reliability.

Statistical analysis

Statistical calculations were performed with SPSS, Version 19. The Kolmogorov-smirnov test was used for normal distribution of the data. The variables in the two groups were compared

using the independent t-test ($p < .05$).. The Chi-Square test was used to compare the frequency of different types of class II/ div 1 malocclusion in two cities.

RESULTS

This study included 194 untreated Class II Division 1 subjects include: 98 samples from Hamadan and 96 samples from Shiraz.(table 1)

Intra-class Correlation analysis showed high correlation Coefficient between first and second tracing for all variables.(ICC>0.8)

Kolmogorov- smirnov test showed the data were normally distributed.

Table 2 shows the results for the comparison of the males and females in each city.

The only statistically significant difference between the males and females for the cephalometric variables was found for anterior cranial base and U1-NA(mm) in Shiraz and for L1- NB and inter incisal angle in Hamadan samples.

Comparison between the cephalometric measurements of Hamadan and Shiraz was shown in table 3.SNB, MP-SN,U1-NA(^{0}),Y-Axis, Inter incisal Angle and PFH/AFH had significant difference between two groups. It shows that class II division 1 patients from Hamadan had a relatively more retruded mandible, greater vertical development and more protruded upper incisors compared with class II division 1 patients from Shiraz.

This study showed that more than 90% of samples in both cities, have mandibular retrognathism and Combination of mandibular retrusion and maxillary prognathism, and maxillary prognathism alone were respectively the next prevalent characteristics of this malocclusion. No statistically significant differences were found for different types of class II division I malocclusion between two groups.(table 4)

DISCUSSION

Class II malocclusion was evaluated in many studies(18-30.) but the results of these studies are different. This malocclusion may be include combination of dental and skeletal problems.

Difference in results of these studies can be due to difference in determination of cephalometric landmarks, sample size, age of patients, racial and inclusion criteria.

Regarding the difference in features of class II malocclusion in different area of Iran, in this study class II malocclusion in Shiraz and Hamadan cities were compared.

This study showed that high percent of patients in both groups had mandibular retrusion. Combination of mandibular retrusion and maxillary prognathism, and maxillary prognathism alone were respectively the next prevalent characteristics of this malocclusion. Therefore functional therapy could be the main strategy for growth modification in both cities.

Two previous Iranian study in Mashhad and Shiraz showed that mandibular retrognathism was the most feature of class II malocclusion in these cities (13,19).

Evaluation of dentoalveolar position showed protrusion of mandibular incisors in both groups. This is in agreement with Salehi(19) and in contrast to Ramezanzadeh(13), Pancherz(9), McNamara(6), Hitchcock(5), Menezes(31) who found the normal inclination of lower Incisors in their samples.

Evaluation of dentoalveolar position showed protrusion of maxillary incisors in both groups and it was more significant in patients from Hamadan. This is in agreement with Salehi(19), Ramezanzadeh(18), Pancherz(8), Hitchcock(33), Menezes(31),Lau(17), Moreno Uribe(25), Rothstein(28).

Retrusion of maxillary incisors and protrusion of mandibular incisors are the side effects of functional appliances. Retrusion of maxillary incisors is desired in Iranian patients but protrusion of mandibular incisors is undesired because it reduces the potential of skeletal correction.

Ramezanzadeh(13),Moreno Uribe(25), Baccetti(29) and Menezes(31) reported normal vertical dimension in their samples while Lau(17), Salehi(19), Ishii(11) and McNamara(30) showed vertical growth pattern in their samples. Bader(22) and Sidlauskas(23)found horizontal growth pattern in their samples.

This study revealed that patients in both groups have vertical growth pattern and it is more significant in patients from Hamadan.

These results show that control of vertical growth is necessary in class II patients.

Regarding these results, educational programming should be done for functional therapy in childhood to avoid complicated treatment and surgery in adulthood

CONCLUSION

This study showed the great similarity in two groups:

- High percent of patients in both groups had mandibular retrusion. Combination of mandibular retrusion and maxillary prognathism, and maxillary prognathism alone were respectively the next prevalent characteristics of this malocclusion.

- Protrusion of upper and lower anterior teeth was observed in both groups.
- vertical growth pattern was seen in both groups but it was more common in Hamadan samples
- These characteristics were not statistically significant between males and females.

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TABLES

Table 1- Age and gender distribution of the samples.

city	sex	N	Mean age ± SD	Total samples	Mean age ± SD
Shiraz	male	48	11/60±1/23	96	11/7±1/30
	female	48	11/89±1/37		
Hamadan	male	45	11/06±1/07	98	11/2±1/20
	female	53	11/32±1/29		

Table 2-comparison of cephalometric measurments between males and females in each city

		Shiraz		Hamedan	
variable	gender	mean± SD	P value	mean± SD	P value
SNA	male	81.24 ± 3.89	.242	80.68 ± 4.27	.759
	female	82.09 ± 3.14		80.92 ± 3.42	
SNB	male	74.46 ± 3.87	.252	73.81 ± 4.03	.925
	female	75.27 ± 2.99		73.74 ± 3.20	

IMPA	male	97.97 ± 7.04	.866	96.99 ± 6.29	.528
	female	97.73 ± 6.60		97.82 ± 6.63	
L1NBMM	male	5.97 ± 2.49	.162	5.43 ± 1.66	.433
	female	5.30 ± 2.17		5.73 ± 2.21	
PFH	male	63.67 ± 4.53	.053	62.94 ± 5.29	.067
	female	62.03 ± 3.54		60.95 ± 5.26	
AFH	male	102.64 ± 6.23	.051	103.24 ± 6.86	.445
	female	100.25 ± 5.48		102.12 ± 7.47	
ACB	male	65.00 ± 3.51	.001 ✯	64.75 ± 4.09	.077
	female	62.70 ± 3.14		63.29 ± 3.95	
U1NAMM	male	4.23 ± 2.34	.029 ✯	3.50 ± 2.23	.375
	female	3.22 ± 2.13		3.89 ± 2.16	
ANB	male	6.75 ± 1.46	.823	6.87 ± 1.41	.284
	female	6.82 ± 1.45		7.18 ± 1.45	
MPSN	male	36.97 ± 6.64	.731	37.74 ± 4.63	.058
	female	36.57 ± 4.31		39.67±5.33	
U1SN0	male	107.57 ± 6.49	.314	106.98 ± 7.41	.167
	female	106.15 ± 7.06		109.03 ± 7.05	
U1NA0	male	26.33 ± 5.65	.063	26.30 ± 6.85	.216
	female	24.06 ± 6.08		28.10 ± 7.39	
L1NB	male	29.41 ± 6.91	.906	28.55 ± 6.07	.020 ✯
	female	29.57 ± 6.24		31.25 ± 4.95	
Yaxis	male	60.24 ± 4.69	.868	60.90 ± 2.86	.290
	female	60.10 ± 3.49		61.61 ± 3.74	
IIA	male	117.48 ± 8.67	.286	118.25±10.15	.012 ✯
	female	119.53 ± 9.88		113.45 ± 8.02	
PAfh	male	62.16 ± 4.70	.795	60.99 ± 3.73	.119
	female	61.95 ± 2.94		59.76 ± 4.01	

Table 3- comparison of means and standard deviations between two cities

	City	N	Mean	Std. Deviation	p-value
SNA	Shiraz	96	81.66	3.55	.111
	Hamedan	98	80.81	3.81	
SNB	Shiraz	96	74.86	3.47	.034☆
	Hamedan	98	73.77	3.58	
IMPA	Shiraz	96	97.85	6.79	.666
	Hamedan	98	97.44	6.45	
L1NBm	Shiraz	96	5.64	2.35	.882
	Hamedan	98	5.59	1.97	
Posterior F.H	Shiraz	96	62.86	4.13	.148
	Hamedan	98	61.86	5.34	
Anterior F.H	Shiraz	96	101.46	5.96	.218
	Hamedan	98	102.63	7.19	
Anterior C.B	Shiraz	96	63.87	3.51	.867
	Hamedan	98	63.96	4.06	
U1-NA (mm)	Shiraz	96	3.73	2.28	.947
	Hamedan	98	3.71	2.19	
ANB	Shiraz	96	6.78	1.45	.221
	Hamedan	98	7.04	1.43	

MP-SN	Shiraz	96	36.77	5.58	.010 ☆
	Hamedan	98	38.79	5.09	
U1-SN	Shiraz	96	106.87	6.78	.228
	Hamedan	98	108.09	7.25	
U1-NA(^{0})	Shiraz	96	25.21	5.94	.031 ☆
	Hamedan	98	27.27	7.17	
L1-NB(^{0})	Shiraz	96	29.49	6.55	.556
	Hamedan	98	30.01	5.63	
Y-Axis	Shiraz	96	60.17	4.12	.041 ☆
	Hamedan	98	61.28	3.37	
Interincisal Angle	Shiraz	96	118.49	9.30	.036 ☆
	Hamedan	98	115.66	9.32	
PF/AF face	Shiraz	96	62.05	3.91	.003 ☆
	Hamedan	98	60.33	3.91	

Table4- Comparison of skeletal characteristics of samples between two cities

city	Maxillary prognathism	p-value	Mandibular retrognathism	p-value	Maxillary prognathism and Mandibular retrognathism	p-value	Total samples

Shiraz	7(7.4%)	.780	53(55.8%)	.664	36(36.8%)	.766	96 (100.0%)
Hamedan	6(6.1%)		58(59.2%)		34(34.7%)		98 100.0%