

Characteristics of Craniofacial Complex For class II Division 1 Malocclusion in Saudi Subjects with Permanent Dentition

Azzam Al Jundi¹

¹ College of Dentistry, King Saud bin Abdulaziz University for Health Sciences, Riyadh

Received: 9 December 2013 Accepted: 3 January 2014 Published: 15 January 2014

Abstract

European-American norms are still used in the orthodontic treatment of Saudi patients, despite the different ethnic backgrounds of Saudis. The aims of this study were to evaluate the Cephalometric features of Class II division 1 in Saudi adult patients and to compare these values with those features of normal occlusion by referring to the effect of the gender on these values. Ninety-four (94) Saudi patients were evaluated Cephalometrically and distributed into two groups where the first group comprised of (45) subjects with normal occlusion. The second group comprised of (49) subjects with Class II division 1. Wide variations were observed for almost all measurements of Class II division 1. However, a posteriorly positioned mandible and shortness in its dimensions were noticed.

Index terms— class ii division 1, cephalometric evaluation, dento skeletal morphology.

1 Introduction

Class II malocclusion is a frequently seen disharmony that has been studied in many different populations [1][2][3][4] because excessive overjet is easily recognized, class II division 1 malocclusion is of a greater concern for both patients and parents.

A review of literature shows that class II malocclusion has been evaluated in all three dimensions of space. In general, these studies have compared the craniofacial morphology of patients with class II malocclusion with class I control subjects.

Studies evaluating maxillary and mandibular skeletal and dental positions and vertical components of class II patients have reported conflicting results from both cross-sectional and longitudinal studies. No common results have been found regarding cranial base configuration.

The class II division 1 malocclusion is the most frequent in particular clinics, [5] caused in most times, by a retrognathic mandible [5,6] McNamara indicated that retrusion of the mandible is the most commonly occurring factor contributing to class II malocclusion, and the average position of the maxilla was found to be neutral in relation to cranial base structures. [7] Although many studies have investigated class II malocclusion characteristics, [7,8,9,10], few have studied the characteristic of skeletal II malocclusion in specific ethnic groups. [5,11,12].

Therefore, in order to provide more specific information regarding this type of malocclusion in Saudi subjects, this comparative Cephalometric study was undertaken.

The objectives of this comparative Cephalometric study were to:

1. Determine the specific Cephalometric features of class II division 1 malocclusion in adult Saudi subjects that had not been previously submitted to any orthodontic treatment.
2. Compare the changes in the dentofacial structure in untreated class II division 1 malocclusion and normal occlusion class I individuals.
3. Evaluation of the following features of the jaws was made: angular and linear sagittal relation between maxilla and mandible and related to the cranial base; geometric proportion between maxilla and mandible; craniofacial growth pattern and position of maxillary and mandibular incisors, presence of differences between genders.

2 II.

3 Materials and Methods

Careful selection was made from the files of orthodontics clinics in King Abdul-Aziz Medical City, National Guard Health Affairs, Riyadh, Kingdom of Saudi Arabia, from January 2013 to June 2014. A minimum sample size of 21 per group (total 42) will have 80% power to detect a difference in means of 1.0 (Change in the skeletal ANB angle), (Cozza P et al, 2006) [13] assuming that the common standard deviation is 1.25 (Sayin & Turkkaharaman, 2005) [14], using a two group t-test with a 0.05 one sided significance.

The radiographic lateral cephalograms used were taken according to the conventional norms.

All cephalograms were taken by the same radiographic apparatus: planmecipromax 3Ds/3D Planmecaoy/Asentajankatu6/00800 Helsinki/Finland. Cephalometric Landmarks were marked and digitized by one author to avoid interobserver variability angular and linear variables were established and measured by: Vistadent ? At software (GAC int. Inc. The reference points, planes and angles used in current study were defined according To Bjork, Riolo et al [15,16] The causal error was calculated according to Dahlberg's formula [17] $ME = \frac{d}{\sqrt{n}}$

Where d is the difference between two registration.

n is the number of duplicate registration and the systematic error with dependent tests, for $P < 0.05$

The error of the method of cephalometric measurement ranged between 0.16mm and 0.41mm for linear measurements, and between 0.18 degree and 0.46 degree for angular measurements. (Allowable inter-and intra-investigator error were 0.5 mm and 0.5 degree) c) Statistical Analysis Descriptive statistic was calculated for all measurements in both groups including the mean, standard deviation, and minimum and maximum values for each parameter. [18] All the statistical analysis were performed by using SPSS-V15 (SPSS Inc., Chicago-ILL).

Anderson-Darling normally tests were performed to check the distribution of data, parametric (two-sample-t-test) or non parametric (Mann-Whitney U test), were used as appropriate to detect significant differences between the two groups with the level significance at 0.05, $p < 0.05$

The comparison between genders in class II division 1 used the same statistical test.

Statistically significant values were considered if $p < 0.05$

There was no difference in the mean position of the maxilla-(SNA) between the two groups, and the class II appeared to be the result of more recessive (SNB) and shorter mandible (Go-Me).

(These results were also supported by maxillary and mandibular skeletal measurements that were not sellanasion based).

This was accompanied by an increased mandibular plane angle (Go-Gn/SN) but no increase in anterior facial height. The increased mandibular plane angle appeared to be the result of a reduced ramus height with a reduced posterior facial height in the class II division1 group.

In class II division I patients, the maxillary incisors were buccally inclined (upper incisor-NA) and the mandibular incisors were buccallyinclined and more protrusive (Lower incisor-NB), the overjet was significantly greater in class II division 1 group.

The cranial base angle ($NS^{\wedge}Ar$) was significantly greater in class II division 1 subjects, and the posterior cranial length (S-Ar) was significantly shorter in class II division 1 group.

The (ANB) angle was significantly greater in class II division 1 subjects.

The Bjork sum ($angleNS^{\wedge}Ar, SAr^{\wedge}Go, ArGo^{\wedge}me$) was significantly greater in class II division 1 subjects.

Angle retuded chin is indicated by small ($SN^{\wedge}Pog$) angle in class II division 1 subjects. IV.

4 Discussion

Class II malocclusion has been evaluated in numerous studies. [19,20,21]. These studies have reported conflicting results about the features of class II malocclusion both in the anteroposterior and vertical dimensions.

Class II malocclusion may results from numerous combination of skeletal and dental components [22] This was also true for our sample because wide variations were observed for almost all measurements of the class II division 1 patients (Table 1, 2).

Fushima et al [21] reported aretruded and smaller mandible in adult females with class II division 1 malocclusion. In another study of adult patients, Gilmore [23] reported that the mandible was shorter in dental class II division 1 patients. Because our results are consistent with previous studies on adults, we suggest that the majority of class II division 1 patients have a normally positioned maxilla but a smaller and more retruded mandible when compared with class I patients.

Conflicting results of studies regarding anteroposterior positions of maxilla and mandible in The sagittal position of the mandible (SNB) presented that it was retracted in relation to the cranial base. The effective length (Go-Me) showed a small sized mandible. These results are in agreement with other studies in the literature. [6,7,24,25,26,27] demonstrating that the mandible presents great participation in this type of malocclusion.

These cephalometric results justify the mandibular advancement for correction of the class II malocclusion in great part of the cases [28,29] Our results indicated that the class II division 1 patients show an increased mandibular plan angle ($NS^{\wedge}Go Me$) but no increase in anterior facial height (ANS-Me).

The increased mandibular plan appeared to be the result of reduced ramus height. In accordance with our results. Fushima et al [21] growing class II patients may be attributed to the individual differences in skeletal growth rates of these patients.

The sagittal position of the maxilla (SNA) in class II division 1 patients was normally positioned similar to the normal class I group, with a well-positioned maxilla in relation to the cranial base, corroborating previous studies [6,7,18,24,25] rotation of the mandible in class II division 1 patients. Bjork and Skieller [30] reported that the intensity of the Condylar growth was strongly correlated with the rotation of the mandible.

Sinclair and Little [31] reported that the degree of vertical mandibular growth was closely correlated with the total amount of condylar growth.

Discrepancy in the posterior face height especially in ramus height may indicate decreased condylar growth in class II division 1 patients. Histological and implant studies [32,33,34] have demonstrated that growth in mandibular length occurs primarily at the condyle, the decreased mandibular length found in class II division 1 patient also supports our findings.

The maxillary incisors presented buccal inclination (UI.NA) in class II division 1 subjects. That findings are in consonance with the results of previous studies [6,7,18,35] .

The position of maxillary incisors presented protrusion in relation to the cranial base (UI^SN) in The angular measurement for the mandibular incisors (LI-NB) presented statistically significant differences, showing mandibular incisors strongly buccally inclined.

The results for the linear position of mandibular incisors (LI-NB) showed protrusion in relation to their apical base, indicating dento-alveolar compensation for the skeletal discrepancy.

The craniofacial growth pattern presented a vertical tendency in class II division 1 subjects, (Bjorksum). These finding are uniform to those mentioned in most studies [7,8,12], however some authors found contrasting results [9,37] The cranial base angle (NS^Ar) was significantly greater in class II division 1 subjects. The larger cranial base angle in class II subjects might explain the distal positioning of the mandible.

The sagittal discrepancy of the skeletal base angle (ANB) presented an increase in this angle in class II division 1 subjects when compared to the normal occlusion subjects corresponding with other studies [5,11] Hopkin et al [38] stated that the cranial base configuration was an etiological factor in determining anteroposterior male relationships of the jaws. However a review of the literarure indicated no common results concerning cranial base configurations of class II patients.

Dhopatkar et al [39] has suggested that cranial base morphology was more important in establishment of mal occlusion when there was a significant skeletal discrepancy. This is also acceptable for our study because our class II patient have significantly greater over jet and ANB angle than class I subjects.

bigger facial dimensions than females with the resemblance in the geometric proportions and craniofacial morphology. class II subjects.This results diverges from studies in the literature ??14 ,36,] V.

5 Conclusion

According to the methodology used, the cephalometric characterizations of Saudi subjects presenting class II division 1 malocclusion were the following:

The maxilla was well positioned in relation to the cranial base and in normal size.

The mandible was smaller in size, posteriorly positioned ((retracted)) and rotated posteriorly when compared with class I subjects.

The geometric proportion between the apical base presented a small mandible and a normal size maxilla.

The craniofacial growth pattern showed a vertical tendency.

The maxillary and mandibular incisors were buccally inclined and protrusively positioned in relation to skeletal base.

Gender comparison revealed that there was statistical difference in linear measurements.

However, there was no difference in angular measurements. This may indicate that males have

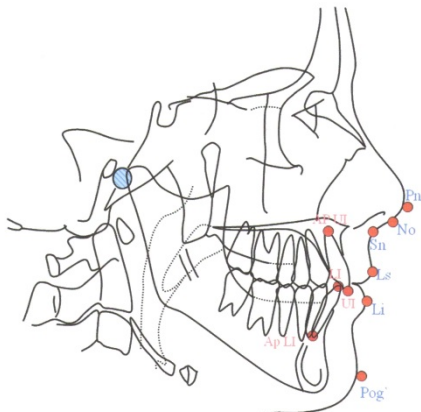


Fig. 2 Cephalometric dental and soft tissue landmarks used in the current study

1

Figure 3: Figure 1 :

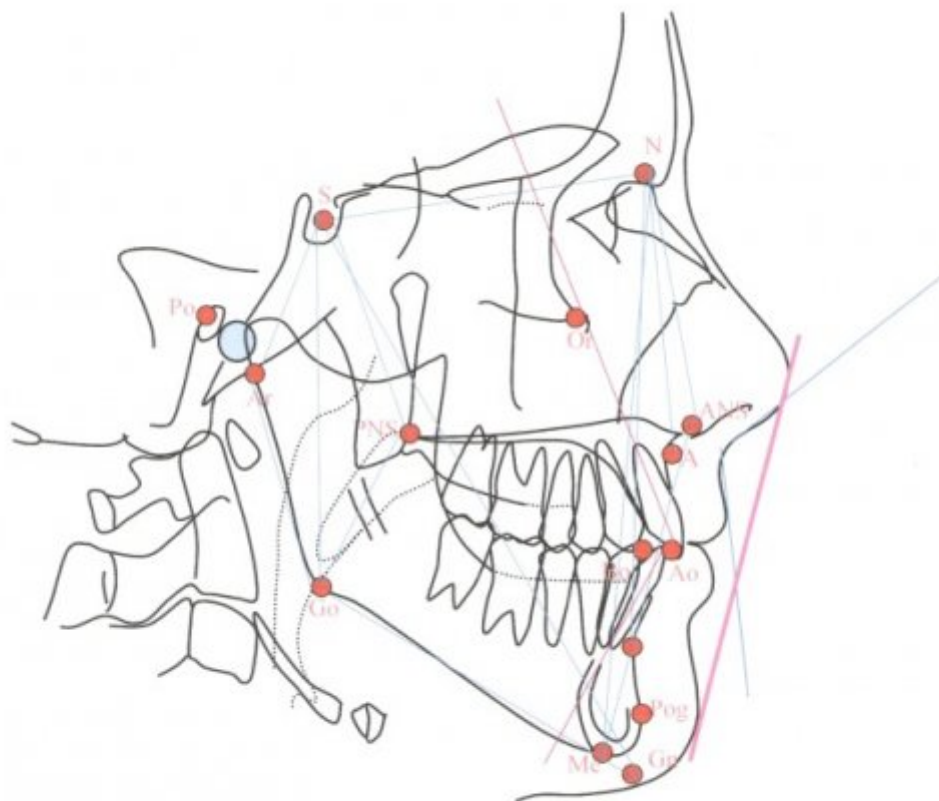


Fig.3 The linear and angular measurements used in the current study

2

Figure 4: Figure 2 :

1

2014

Year

Volume XIV Issue VI Version I

() J

Tables (1-4) show descriptive statistics and comparison of cephalometric measurements between two groups.

Variable	Class II, 1			Class I			P
	Pts N	Mean	SD	Pts N	Mean	SD	
NS ^GoMe 49		33.63	2. 78	45	31.00	3.39	0.00
Ns ^PP	49	8.01	1.15	45	7.93	1.99	0.18
NSAr	49	125.91	2.91	45	123.95	2.33	0.00
SArGO	49	142.91	2.58	45	141.11	1.70	0.00
ArGoMe	49	133.08	3.45	45	129.72	4.59	0.00
Sum(Bjork)	49	400.01	4.07	45	396.58	5.91	0.00
NSPog	49	69.98	3.22	45	66.20	4.13	0.00
SNA	49	81.66	2.51	45	80.96	3.02	0.22
SNB	49	75.42	3.14	45	78.53	2.81	0.00
ANB	49	6.21	1.94	45	2.57	1.01	0.00
SNPog	49	78.04	2.84	45	82.39	2.57	0.00
NAPog	49	184.93	3.90	45	179.10	4.40	0.00
MM	49	28.57	2.92	45	25.84	3.12	0.00
UI ^SN	49	109.63	4.58	45	102.49	4.45	0.00
UI ^Spp	49	67.69	4.23	45	70.10	3.25	0.00

Figure 5: Table 1 :

3

Variable	Sex	No	Min	Max	Mean	SD	P
N-S	M	26	67.16	77.25	72.88	2.68	0.04
	F	23	65.81	75.64	70.82	2.58	
S-Ar	M	26	28.68	39.82	33.76	2.93	0.08
	F	23	29.15	37.61	32.30	2.49	
Ar-Go	M	26	46.50	56.62	51.22	2.80	0.34
	F	23	45.83	55.15	50.48	2.57	
Go-Me	M	26	7.35	79.62	74.93	2.84	0.00

Figure 6: Table 3 :

2

	Class II, division 1			Normal Occlusion				
Variable	No	Mean	SD	No	Mean	SD	P	
N-S	49	72.49	2.70	45	73.11	3.82	0.12	
S-Ar	49	33.07	2.80	45	36.25	2.82	0.00	
Ar-Go	49	50.88	2.69	45	52.34	3.18	0.01	
Go-Me	49	73.43	3.00	45	76.83	4.73	0.00	
S-Go	49 49	82.12	40.68	2.26	45 45	86.04 41.16	5.53	0.00
S-PNS			1.91			3.59	0.73	
								Volume
								Issue
								VI
								Ver-
								sion
								I

Figure 7: Table 2 :

4

	PNS-GO	M	26	37.46	45.15	41.87	2.15	0.04
		F	23	36.85	44.67	40.71	1.79	
2014								
Year								
Volume								
XIV								
Is-								
sue								
VI								
Ver-								
sion								
I								
() J	Variable	Sex	No	Min	Max	Mean	SD	P
	NS ^GoMe M		26	27.68	38.65	33.73	2.99	0.70
		F	23	26.94	37.16	33.53	2.58	
	Ns ^PP	M	26	6.35	10.05	8.21	1.14	0.29
		F	23	5.65	9.26	7.79	1.15	
	NSAr	M	26	120.95	131.61	125.99	2.65	0.85
		F	23	119.95	131.46	125.83	3.24	
	SArGO	M	26	138.26	147.16	143.30	2.48	0.92
		F	23	136.26	145.03	142.46	2.68	
	ArGoMe	M	26	125.54	138.74	132.92	3.70	0.93
		F	23	128.15	139.25	133.25	3.23	
	Bjork Sum	M	26	392.94	411.37	399.97	4.51	0.88
		F	23	396.12	408.06	400.05	3.60	
	NSPog	M	26	61.58	75.16	69.25	3.58	0.09
		F	23	66.22	76.13	70.81	2.61	
	SNA	M	26	77.82	86.94	81.81	2.50	0.66
		F	23	76.65	87.61	81.49	2.58	
	SNB	M	26	71.42	80.90	75.37	2.83	0.77
		F	23	68.35	83.31	75.48	3.53	
	ANB	M	26	4.21	10.01	6.43	1.37	0.33
		F	23	.70	11.10	5.97	2.45	
© 2014 Global Journals Inc. (US)								

Figure 8: Table 4 :

148 [Sassouni ()] 'A Classification of skeletal facial types'. V Sassouni . *Am J Orthod* 1969. 55 (2) p. .

149 [Riesmeijer et al. ()] 'A comparison of craniofacial Class I and Class II growth patterns'. A M Riesmeijer , B

150 Prahl-Andersen , A K Mascarenhas , B H Joo , K W Vig . *AM J Orthod Dentofacial Orthop* 2004. 125 p. .

151 [Kim and Nielsen ()] 'A Longitudinal study of condylar growth and mandibular rotation in untreated subjects

152 with Class II malocclusion'. J Kim , L I Nielsen . *Angle Orthod* 2002. 72 p. .

153 [Mcnamarajr ()] 'A method of Cephalometric evaluation'. J A Mcnamarajr . *Am J Orthod* 1984. 86 (6) p. .

154 [Buschang et al. ()] 'A polynomial approach to craniofacial growth: description and comparison of adolescent

155 males with normal occlusion and those with untreated Class II malocclusion'. P H Buschang , R Tanguay ,

156 J Tukewicz , A Demirjan , La Plame . *Am J Orthod DentofacialOrthop* 1986. 90 (5) p. .

157 [Enlow and Harris ()] 'A study of postnatal growth of the human mandible'. D H Enlow , D B Harris . *Am J*

158 *Orthod* 1964. 50 p. .

159 [Riolo et al. ()] *An atlas of craniofacial growth: Cephalometric standards from the University school growth study.*

160 *Ann Arbor: Centre of human growth and developments*, M L Riolo , R E Moyers , J A Mcnamara , Hunter

161 Ws . 1974. University of Michigan.

162 [Dhopatkar et al. ()] 'An investigation into the relationship between the cranial base angle and malocclusion'. A

163 Dhopatkar , S Bhatia , P Rock . *Angle Orthod* 2002. 72 p. .

164 [Bjork ()] A Bjork . *Face in Profil. Svensk Tandläkartidskrift. Berlingska Boktryckeriet Lund*, 1949. 40.

165 [Sayino ()] 'Cephalometric evaluation of non-growing females with skeletal and dental class II division 1

166 malocclusion'. Turkkaharaman H Sayino . *Angle Orthod* 2005. 75 p. .

167 [Bishara et al. ()] 'Changes in dentofacial structures in untreated Class II division 1 and normal subjects: a

168 Longitudinal study'. S E Bishara , J R Jakobsen , B Vorhies , P Bayati . *Angle Orthod* 1997. 67 (1) p. .

169 [Mcnamarajr ()] 'Components of Class II malocclusion in children 8-10 years of age'. J A Mcnamarajr . *Angle*

170 *Orthod* 1981. 51 (3) p. .

171 [Sarhan and Hashim ()] 'Dento-skeletal components of Class II malocclusions for children with normal and

172 retruded mandible'. O A Sarhan , H A Hashim . *J ClinPediat Dent* 1994. 18 p. .

173 [Carter ()] 'Dentofacial changes in untreated Class II division 1 students'. N E Carter . *Br J Orthod* 1987. 14 (4)

174 p. .

175 [Sinclair Pm Little ()] 'Dentofacial maturation of untreated normals'. R M Sinclair Pm Little . *Am J Orthod*

176 1985. 88 p. .

177 [Moyers et al. ()] 'Differential diagnosis of Class II malocclusion part 1. Facial types associated with Class II

178 malocclusions'. R E Moyers , M L Riolo , K E Guire , R L Wainright , F L Bookstein . *Am J Orthod* 1980.

179 78 (5) p. .

180 [Bjork A and Skieller ()] 'Facial development and tooth eruption. An implant study at the age of puberty'. Bjork

181 A , V Skieller . *Am J Orthod* 1972. 62 p. .

182 [Bjork ()] 'Facial growth in man, studied with the aid of metallic implants'. A Bjork . *Acta Odont Scand* 1955.

183 13 p. .

184 [Rothstein ()] 'Facial morphology and growth from 10 to 14 years of age in children presenting Class II division

185 1 malocclusion: a comparative Cephalometric study'. T L Rothstein . *Am J Orthod* 1971. 60 (6) p. .

186 [Rudzki-Janson and Noachtar ()] *Functional appliance therapy with Bionator SeminOrthod*, I Rudzki-Janson , R

187 Noachtar . 1998. 4 p. .

188 [Johnston ()] 'Functional appliances: a mortgage on mandibular position'. J R Johnston . *AustOrthod J* 1996.

189 14 (3) p. .

190 [Ngan et al. ()] 'Longitudinal evaluation of growth changes in Class II division 1 subjects'. P W Ngan , Bycke

191 , J Scheick . *SeminOrthod* 1997. 3 (4) p. .

192 [Malhews and Ware ()] 'Longitudinal mandibular growth in children with tantanium implants'. J R Malhews ,

193 W H Ware . *Am J Orthod* 1978. 74 p. .

194 [Cozza et al. (2006)] 'Mandibular changes produced by functional appliances in class II malocclusion: A

195 systematic review'. P Cozza , Baccettit , L Franchi , L Detoffol , J Mcnamara . *AmJ Orthod Dento facial*

196 *Orthop* 2006 May. 129 (5) p. .

197 [Bishara ()] 'Mandibular changes in persons with untreated and treated Class II division 1 malocclusion'. S E

198 Bishara . *AmJ OrthodDentofacialorthop* 1998. 133 (6) p. .

199 [Gilmore ()] 'Morphology of the adult mandible in Class II division 1 malocclusion and in excellent occlusion'.

200 W A Gilmore . *AngleOrthod* 1950. 20 p. .

201 [Feldmann et al. ()] 'Occlusal changes from adolescence to adulthood in untreated patients with Class II division

202 1 deep bite malocclusion'. I Feldmann , F Lundstrom , Pecks . *Angle Orthod* 1999. 69 (1) p. .

5 CONCLUSION

- [Lauc ()] ‘Orofacial analysis on the Adriatic islands: An epidemiological study of malocclusion on Hvarisland’.
T Lauc . *Eur J Orthod* 2003. 25 p. .
- [Ishiin and Hunt ()] ‘P Craniofacial morphology of Japanese girls with class II division 1 malocclusion’. Deguchi
T Ishiin , N Hunt . *J Orthod* 2001. 28 p. .
- [Ast et al. ()] ‘Prevalence and Characteristics of malocclusion among senior high school students in up-state New
York’. D B Ast , J P Carlos , D C Cons . *AmJ Orthod* 1965. 51 p. .
- [Silva and Ds ()] ‘Prevalence of malocclusion among Latino adolescents’. R G Silva , Kang Ds . *Am J Orthod
Dentofacialorthod* 2001. 119 p. .
- [Fushima et al. ()] ‘Significance of the cant of the posterior occlusal plane in class II division 1 malocclusion’. K
Fushima , Kitamuray , H Mita , S Sato , Y Suzuki , Y H Kim . *Eur J Orthod* 1996. 18 p. .
- [Dahlberg ()] *Statistical methods for medical and biological students*, G Dahlberg . 1940. New York: Interscience.
- [Sassouni ()] ‘The class II syndrome: differential diagnosis and treatment’. V Sassouni . *Angle Orthod* 1070. 40
(4) p. .
- [Hopkin et al. ()] ‘The cranial base as an etiological factor in malocclusion’. G B Hopkin , Wjb Houston , G A
James . *Angle Orhtod* 1968. 38 p. .
- [El ()] ‘The prevalence of malocclusion amongst Hongkong male dental students’. Tang El . *Br J Orthod* 1994.
21 p. .
- [Reidel ()] ‘The relation of maxillary structure to cranium in malocclusion and in normal occlusion’. R A Reidel
. *Angle Orthod* 1952. 22 (3) p. .
- [Phelan et al. ()] ‘Variation in Class II malocclusion: Comparison of Mexican mestizos and American white’. T
Phelan , Buschangph , R G Behrents , A M Wintergerts , R F Ceen , A Hernandez . *Am J OrthodDentofacial
Orthop* 2004. 125 (4) p. .
- [Bjork ()] ‘Variation in the growth pattern of the human mandible: Longitudinal radiographic study by the
implant method’. A Bjork . *J Dent Res* 1963. 42 p. .