

Diagnostic features of Angle's Class II div 2 malocclusion

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Abstract

Statement of Problem: A thorough knowledge of the salient features of malocclusion makes the practitioner to come to a proper diagnosis and to formulate proper mechanotherapy. It also helps to predict the prognosis, prior to the onset of treatment process. Among the various malocclusions, Class II div 2 occurs the least often. The literature review does not clearly describe the classical skeletal and dental features of Angle's Class II div 2 malocclusion.

Purpose of Study: The aim of this study is to describe the unique features of Angle's Class II division 2 malocclusion.

Materials and Methods: A total of 612 pre-treatment records (study models and cephalograms), with age ranging from 14 to 25 years, were obtained from the hospital records of Drs Sudha and Nageswar Rao Siddhartha Institute of Dental Sciences. Among these samples, 317 were Class II div 1 and 295 were Class II div 2. The lateral cephalograms were analyzed by using Kodak software and the arch width analysis was calculated by using digital vernier calipers.

Results: Student's *t* test was used for the study. On the cephalograms, the vertical skeletal measurements and few of the dental variables showed a significant difference. On the plaster models, the maxillary transverse measurements revealed a notable discrimination between the groups. **Conclusion:** Angle's Class II div 2 malocclusion has a marked horizontal growth pattern with decreased lower facial thirds, palatally inclined upper anteriors, and remarkably increased transverse maxillary arch dimensions.

Key words: *Class II div 2, facial height, growth pattern, malocclusion*

INTRODUCTION

Malocclusion is the false arrangement of teeth in three planes of space. Angle classified malocclusion in the sagittal plane based on the dental relationship and ignoring the skeletal relation. The disto-occlusion is categorized into division 1 and division 2 based on the spatial orientation of upper anterior teeth. Apart from these basic features,

there were no characteristic features pertaining to Class II div 2 in the literature. The Class II div 2 malocclusion is rare and procuring the study sample is always a difficult task. Even though Angle gave the classification of malocclusion in 1890s, there is still lack of clarity regarding the classical features of Class II div 2 malocclusion.

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Moorrees *et al.*,^[1] Buschang *et al.*,^[2] and Walkow and Peck^[3] analyzed the study models of Class II div 1 and div 2 and summarized that Class II div 2 malocclusion exhibited decreased intercanine width. Pancherz *et al.*^[4] assessed the cephalometric parameters between these two groups and found that mandibular retrognathism was a similar feature in both the groups.

In the current scenario, evidence-based dentistry plays an important role for any dental professional. An orthodontist should be abreast with the classical appearance of a malocclusion, as this may help the professional to choose the best treatment possible for the patient.

The aim of this study is to differentiate the cephalometric and transverse arch dimensions between Angle's Class II div 1 and div 2 malocclusions, in order to understand the diagnostic features of Class II div 2 malocclusion.

MATERIALS AND METHODS

The diagnostic study casts and the lateral cephalometric radiographs required for the study were obtained from the hospital records of Drs Sudha and Nageswara Rao Siddhartha Institute of Dental Sciences. A total of 612 pre-treatment records were obtained, with age ranging from 14 to 25 years; of these, 317 were Class II div 1 and 295 were Class II div 2 malocclusions.

The inclusion criteria were Angle's Class II molar relationship on both the sides, with all the permanent teeth erupted, and an increased horizontal and vertical overlapping greater than 5 mm and 4 mm, respectively, for Class II div 1 malocclusion and overjet of 3 mm and 100% overbite for Class II div 2 malocclusion.

The lateral cephalometric radiographs were analyzed by using Kodak software. The transverse arch width dimensions were measured by using digital vernier calipers (parameters used are explained in figures). The vernier calipers is adjusted to the nearest 0.001 error limit.

An appropriate statistical test was used to assess the cephalometric variables and transverse arch dimensions between the study groups.

RESULTS

Intragroup evaluation was done at first to rule out sexual difference within the study groups. After the final verification that the sex did not have a variable difference, males and females in either of the study group were combined to evaluate the cephalometric and transverse arch dimensions.

The vertical linear variables and dental variables on the cephalometric radiograph [Figures 1-4 and Table 1] revealed a notable variation (Jarabak ratio, lower facial third and Down's mandibular plane angle).

The maxillary transverse arch dimensions [Figure 5 and Table 2] were comparatively more in Angle's Class II div 2 group of malocclusion. A notable difference was not found with respect to the mandibular arch width parameters [Figure 6 and Table 2].

DISCUSSION

In 1950s, studies were conducted in the Department of Orthodontics, University of Illinois to evaluate the dental features and skeletal arrangement among various malocclusions.^[5,6] Valleria and Nelson^[7]

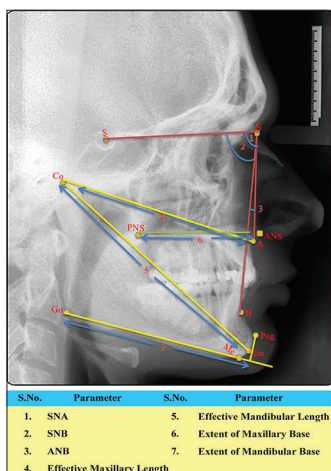


Figure 1: Skeletal sagittal parameters

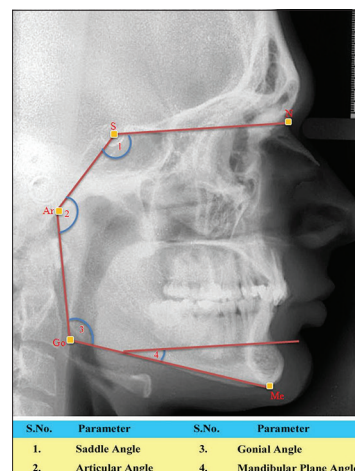


Figure 2: Skeletal vertical parameters – angular

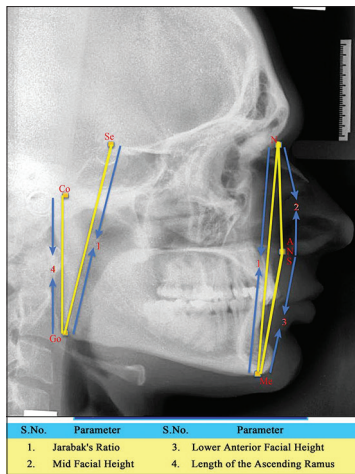


Figure 3: Skeletal vertical parameters – linear

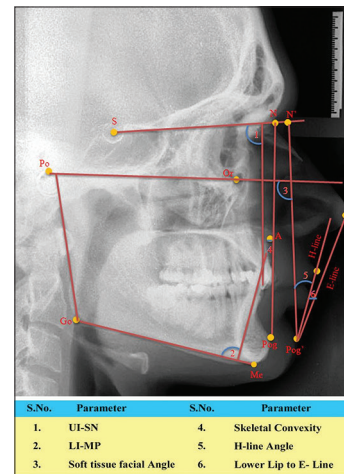


Figure 4: Dental and soft tissue parameters

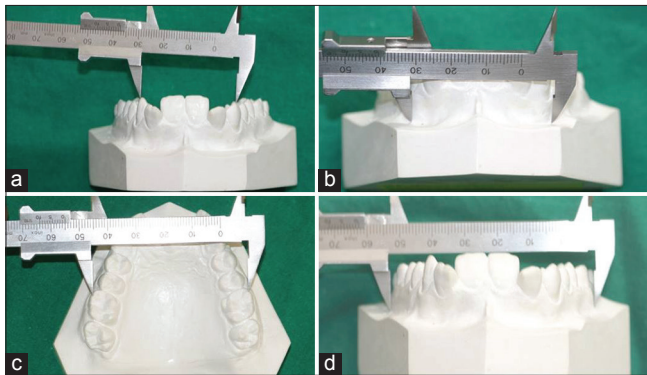


Figure 5: Maxillary arch width parameters. (a) Maxillary intercanine width (b) Basal arch width at Maxillary canines (c) Maxillary intermolar width (d) Basal arch width at Maxillary molars

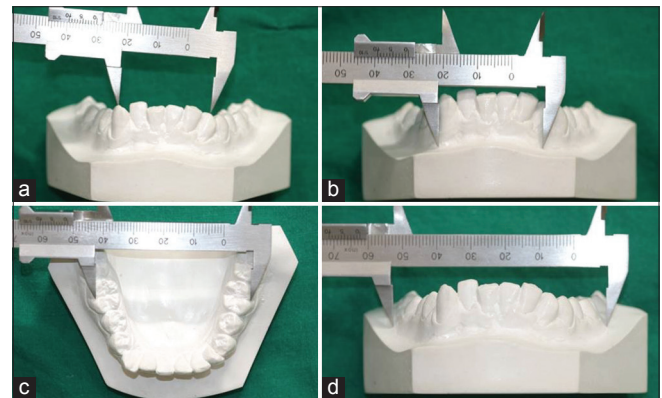


Figure 6: Mandibular arch width parameters. (a) Mandibular intercanine width (b) Basal arch width at mandibular canines (c) Mandibular intermolar width (d) Basal arch width at mandibular molars

reported that analyzing cephalometric radiograph helps the orthodontist to arrive at treatment planning. Staley *et al.*^[8] and Sergl *et al.*^[9] reported that the transverse arch dimensions and the apical bases, too, have a diagnostic potential. Hence, we have evaluated both cephalometric and transverse arch dimensions in the present study.

Cephalometric parameters

The SNA, SNB, and ANB angles were measured in both the groups because of their importance in orthodontic diagnosis. To analyze the position and spatial orientation of bony bases, certain important parameters from McNamara analysis^[10] and Schwartz analysis^[11] were taken into consideration. The dental parameters included in the study were orientation of upper incisor with sella-nasion plane (UI-SN plane) and lower incisor to mandibular plane (Go-Me). Facial angle, skeletal convexity, H-line angle, and lower lip to Ricketts E-line were included as a part of the study. This is as a result of the soft tissue paradigm.^[12]

There was no statistically significant difference in the sagittal parameters [Figures 1-4]. Both the groups were shown to have Class II skeletal bases with a mild retrognathic mandible. These results were in accordance with Panchez *et al.*^[4] and Isik *et al.*^[13] and contrasted with Rosenblum,^[14] Demisch *et al.*,^[15] and Peck *et al.*^[16] There was no posterior mandibular displacement in the study population.

The skeletal vertical parameters [Figures 2 and 3] showed a clear hypodivergent growth pattern with decreased lower facial thirds in Class II div 2 group of malocclusion [Table 1]. This is in accordance with Houston,^[17] Bjork and Skeiller,^[4] Panchez *et al.*,^[4] Karlson,^[12] and Peck *et al.*^[16] The anticlockwise rotation in Class II div 2 malocclusion may be because of lack of incisor support.

The maxillary anterior teeth were absolutely retroclined in the Class II div 2 group, as per Angle's abbreviation of Class II div 2 malocclusion. Lower anteriors were near

Table 1: Mean comparison of cephalometric parameters between Class II DIV 1 and Class II div 2 groups

Parameters	Males		Females		P Value	Significant
	Mean	SD	Mean	SD		
Skeletal Sagittal Parameters						
SNA(°)	82.15	4.11	83.23	4.35	0.24	NS
SNB(°)	76.61	3.74	77.48	3.32	0.29	NS
ANB(°)	5.55	1.77	5.74	2.16	0.52	NS
Effective Maxillary length (Co-A) (mm)	91.29	4.74	92.94	5.86	0.22	NS
Effective Mandibular length (Co-Gn) (mm)	115.41	7.44	114.71	9.29	0.74	NS
Extent of Maxillary Base PNS- A.perp (mm)	52.15	3.47	51.69	4.14	0.63	NS
Extent of Mandibular Base Go-Pog (mm)	76.97	7.03	78.39	6.24	0.40	NS
Skeletal vertical parameters						
Saddle angle(°)	126.00	4.70	124.61	5.13	0.22	NS
Articular angle(°)	143.61	5.95	143.39	6.20	0.88	NS
Gonial angle(°)	120.42	7.51	117.97	7.11	0.31	NS
Sum of the Posterior Angles(°)	390.45	5.32	385.97	6.60	0.00	S
Mandibular plane angle (°)	29.70	5.70	24.97	6.31	0.00	S
Jarabak's ratio (PFH/AFH%)	63.76	20.36	73.59	6.34	0.01	S
Mid Facial Height N-ANS (mm)	52.76	3.24	53.68	3.38	0.27	NS
Lower Anterior Facial Height ANS-Me (mm)	67.53	5.30	62.71	8.22	0.01	S
Length of Ascending Ramus (mm)	60.65	6.43	60.32	7.39	0.85	NS
Dental Parameters						
UI-SN(°)	119.21	7.28	88.87	7.49	0.00	S
LI-MP(°)	103.27	18.36	98.94	9.45	0.26	NS
Soft Tissue Parameters						
Facial angle (°)	86.97	3.46	88.35	4.00	0.14	NS
Skeletal Convexity (mm)	3.71	2.15	3.77	2.89	0.91	NS
H-line angle(°)	21.45	3.57	21.35	3.65	0.98	NS
Lower lip-E. line (mm)	2.57	2.67	0.90	2.55	0.01	S

S: Significant, NS: No significant

Table 2: Mean comparison of arch width parameters between class II div 1 and class II div 2 groups

Parameters	Males		Females		P	Sig.
	Mean	SD	Mean	SD		
Maxillary arch						
Inter canine width	34.59	2.68	34.98	3.26	0.59	NS
Inter molar width	50.62	3.71	52.24	2.91	0.05	S
Basal arch width at first molars	59.01	3.63	59.35	4.69	0.75	NS
Basal arch width at canines	37.38	3.48	39.80	5.34	0.03	S
Mandibular arch						
Inter canine width	26.57	3.18	26.73	3.08	0.84	NS
Inter molar width	47.26	3.35	47.41	3.45	0.86	NS
Basal arch width at first molars	56.51	3.22	57.06	5.82	0.64	NS
Basal arch width at canines	29.00	2.74	30.73	5.59	0.11	NS

SD=Standard deviation

normal without much difference between both the groups [Table 1]. This is in accordance with Thompson.^[18]

There was no significant difference between the two study groups with respect to the soft tissue measurements except for the linear measurement of lower lip to Ricketts E-line. The lower lip was slightly behind the Ricketts E-line in Class II div 2 group. This might be the reason for prominent chin, deep mentolabial sulcus, and poor retention (excessive pressure exerted by lower lip on the upper anteriors).^[19]

The maxillary arch width parameters [Figure 5 and Table 2] were increased with a statistically significant difference in Class II div 2 group of malocclusion. The results of the present study were similar to Buschang *et al.*,^[2] Staley *et al.*,^[8] and Sayin and Turkkahraman.^[20] These results educate the orthodontist to choose for non-extraction mode of therapy, unless the patient's soft tissue integument demands for extraction.

There was no statistically significant difference in the mandibular arch widths. As there is normal or increased

maxillary arch width and narrowing of mandibular arch width, there is more probability for the occurrence of malalignment in the lower arch in Class II div 2 group. This may necessitate a single incisor extraction most often.

Limitations

Nowadays the treatment plan is mainly based on the soft tissue integument of the patient. The patients attending the Department of Orthodontics have the major complaint of facial esthetics. The main setback of the study is that we have focused only on the lateral cephalograms and study models, not considering the clinical examination.

The study had focused only on the local population and, therefore, some results may be contradicting with the world's averages.

CONCLUSION

The classical features of Angle's Class II div 2 group of malocclusion were as follows:

- Orthognathic maxilla and a mild retrognathic mandible
- Marked horizontal growth pattern with forwardly rotated mandibular base
- Skeletal deep bite
- Retroclined upper incisors with near-normal lower anteriors
- Lower lip placed slightly behind E-line with prominent chin
- Increased transverse maxillary values (intercanine and intermolar widths; basal arch width at canines and molars)
- Restricted mandibular arch width, hence, increased chances for crowding in lower arch.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Moorrees CF, Grøn AM, Le Bret LM, Yen PK, Fröhlich FJ. Growth studies of the dentition: A review. *Am J Orthod* 1969;55:600-16.
2. Buschang PH, Stroud J, Alexander RG. Differences in dental arch morphology among adult females with untreated Class I and Class II malocclusion. *Eur J Orthod* 1994;16:47-52.
3. Walkow TM, Peck S. Dental arch width in Class II Division 2 deep-bite malocclusion. *Am J Orthod Dentofacial Orthop* 2002;122:608-13.
4. Panchez H, Zeiber K, Hoyer B. Cephalometric characteristics of Class II division 1 and Class II division 2 malocclusions: A comparative study in children. *Angle Orthod* 1997;67:111-20.
5. Blair ES. A cephalometric roentgenographic appraisal of the skeletal morphology of Class I, Class II, Div. 1, and Class II, Div. 2 (Angle) malocclusions. *Angle Orthod* 1954;24:106-19.
6. Ross-Powell RE, Harris EF. Growth of the anterior dental arch in black American children: A longitudinal study from 3 to 18 years of age. *Am J Orthod Dentofacial Orthop* 2000;118:649-57.
7. Vallera J, Nelson S. Orthodontists' consensus regarding cephalometric variables in diagnosis and treatment planning. *J Dent Res* 1997;76:160.
8. Staley RN, Stuntz WR, Peterson LC. A comparison of arch widths in adults with normal occlusion and adults with class II Division 1 malocclusion. *Am J Orthod* 1985;88:163-9.
9. Serfl HG, Kerr WJ, McColl JH. A method of measuring the apical base. *Eur J Orthod* 1996;18:479-83.
10. McNamara JA Jr. A method of cephalometric evaluation. *Am J Orthod* 1984;86:449-69.
11. Schwarz AM. Roentgenostatics. A practical evaluation of the x-ray headplate. *Am J Orthod* 1961;47:561-85.
12. Karlsen AT. Craniofacial Characteristics in children with Angle Class II div. 2 malocclusion combined with extreme deep bite. *Angle Orthod* 1994;64:123-30.
13. Isik F, Nalbantgil D, Sayinsu K, Arun T. A comparative study of cephalometric and arch width characteristics of Class II division 1 and division 2 malocclusions. *Eur J Orthod* 2006;28:179-83.
14. Rosenblum RE. Class II malocclusion: Mandibular retrusion or maxillary protrusion? *Angle Orthod* 1995;65:49-62.
15. Demisch A, Ingervall B, Thüer U. Mandibular displacement in Angle Class II, division 2 malocclusion. *Am J Orthod Dentofacial Orthop* 1992;102:509-18.
16. Peck S, Peck L, Kataja M. Class II division 2 malocclusion: A heritable pattern of small teeth in well-developed jaws. *Angle Orthod* 1998;68:9-20.
17. Houston WJ. A cephalometric analysis of Angle class II, division II in the mixed dentition. *Dent Pract Dent Rec* 1967;17:372-6.
18. Thompson JR. Abnormal function of the temporomandibular joints and related musculature. Orthodontic implications. Part II. *Angle Orthod* 1986;56:181-95.
19. Lapatki BG, Mager AS, Schulte-Moenting J, Jonas IE. The importance of the level of the lip line and resting lip pressure in Class II, Division 2 malocclusion. *J Dent Res* 2002;81:323-8.
20. Sayin MO, Turkkahraman H. Comparison of dental arch and alveolar widths of patients with Class II, division 1 malocclusion and subjects with class I ideal occlusion. *Angle Orthod* 2004;74:356-60.