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An Evaluation of Skeletal and Dental Asymmetries in Angle's Class II Subdivision Malocclusion in Central India Population

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Abstract: ***Class II Subdivision malocclusions are unique in that they display characteristics of both Class I and Class II malocclusions within the same patient. The difference in occlusion between the right and left sides of the dentition presents a challenge for clinicians when attempting to diagnose and treatment plan these malocclusions. Although most of the previous research in this area faults the dentition for the asymmetry, this study aims to evaluate the symmetry/asymmetry of the skeletal components between the Class I side and the Class II side of Class II Subdivision malocclusions. A total of 100 patients were selected from the archival patient records of Department of Orthodontics and Dentofacial Orthopedics, Sharad Pawar Dental College, Sawangi (Meghe), Wardha. They were divided into 3 groups; 50 class II subdivision, 50 class II and 50 class I. The results showed that there is a presence of skeletal asymmetry, while no dental asymmetry was found.***

Keywords: Class II Subdivision, skeletal asymetry, dental asymmetry

1. Introduction

Angle describes Class II malocclusions as dental relationships where the lower first molars are locked distally to the upper first molars by at least half a cusp width on both the left and right sides of the jaw when compared to Class I. This causes the other teeth in the arch to also erupt distally to the upper teeth and often gives the appearance of a retrusive lower dentition and mandible.Unilateral Class II cases were classified as subdivision cases by Angle. He reported that a Class II molar relationship developed because of the distal eruption of the mandibular first molars in relation to normally positioned maxillary first molars[1]

Class II subdivision malocclusions can be extremely challenging for diagnosis and treatment planning because many clinicians have difficulty in identifying the cause of the malocclusion.[2] Since Angle Class II subdivision malocclusions possess characteristics of both Class I and Class II malocclusions, there is asymmetry between the right and left sides of the dentition. This asymmetry often requires asymmetric extractions or mechanics during treatment, which can be very complicated. [1-4] The etiology of the asymmetry can be quite complex. It could be dental related, skeletal related, or a combination of both.
Class II subdivisions are estimated to account for up to 50% of all Class II malocclusions and are among the most common dental asymmetries in the orthodontic population.[6-7]

Before planning orthodontic treatment to correct subdivision problems, the origin of the asymmetry must be identified. If any dental midline deviation or an asymmetric occlusion is observed, the clinician must check for skeletal asymmetries, dental asymmetries, and functional shifts. Manipulating the patient into centric relation or using an occlusal splint to verify the position of the mandible is an important first step in correctly diagnosing any type of asymmetry.

Alavi et al[8] in their study showed that the unilateral distal positioning of the mandibular first molars was the primary contributor to an anteroposterior discrepancy in this type of malocclusion, but they did not define that the mandibular molar position was due to a skeletal or a dentoalveolar asymmetry.

Rose et al[9] also achieved similar results in their study that the mandible in Class II subdivision malocclusions did not exhibit unusual skeletal positioning or skeletal asymmetry. Only the mandibular dentition was found to be asymmetric, resulting in a relative distal positioning of the lower first molar on the Class II side.

Janson et al[4] found similar results with that of Rose et al[9], that mandible showed no unusual skeletal or positional asymmetries. However another study conducted by Janson et al[10] found results that were opposing the previous studies. There was a tendency for mandibular asymmetry in subgroups of Class II subdivision subjects compared with the control group. Habets et al[11] described a method for evaluating condylar and ramal asymmetry using an OPG in diagnosis of temporomandibular joint disorders.

The use of panoramic radiographs to evaluate side-to-side differences is questionable. However, a number of studies have suggested that acceptable results can be achieved with panoramic radiographs which are noninvasive, have a favorable cost-benefit relationship, and expose subjects to relatively low doses of radiation.[12]

In our study OPG has been used for the measurement of condylar, ramal, total heights and height differences between right and left side of the mandible and also to define side-to-side asymmetries.

No study has been reported in the literature till date on the evaluation of the asymmetries in Class II subdivision malocclusion using the method given by Habets et al[11] i.e. by measuring the condylar and ramal asymmetry in Class II subdivision patients and comparing it with that of other malocclusion groups.

2. Materials and Methods

A total of 150 OPGs and dental cast models were selected from the archival patient records of Department of Orthodontics and Dentofacial Orthopedics, Sharad Pawar Dental College, Sawangi (Meghe), Wardha.
Group 1 - 50 patients models with class I malocclusions.
Group 2 - 50 patients models with class II Div 1 malocclusions.
Group 3 - 50 patients models with class II subdivision malocclusions.
Out of 50 subdivision cases, 32 patients had Class II molar relation on the left side and 18 on the right side.

All OPGs were taken in standard manner by the same operator. The subjects were positioned with the lips in rest position and the head oriented to the Frankfort horizontal plane. All the films were traced and measured by the same author.

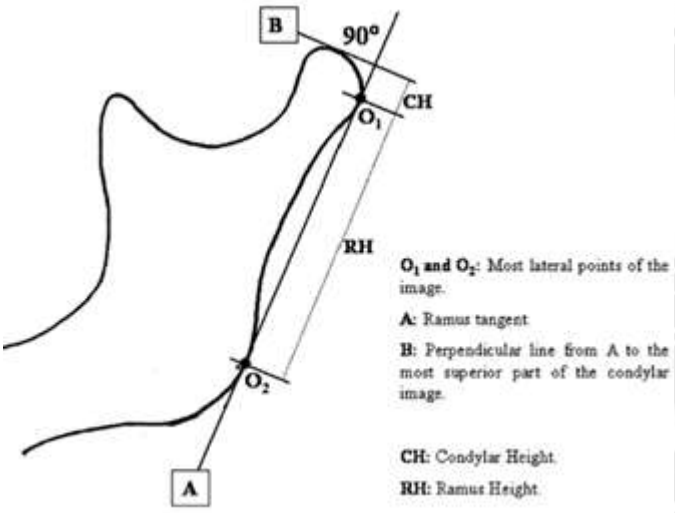


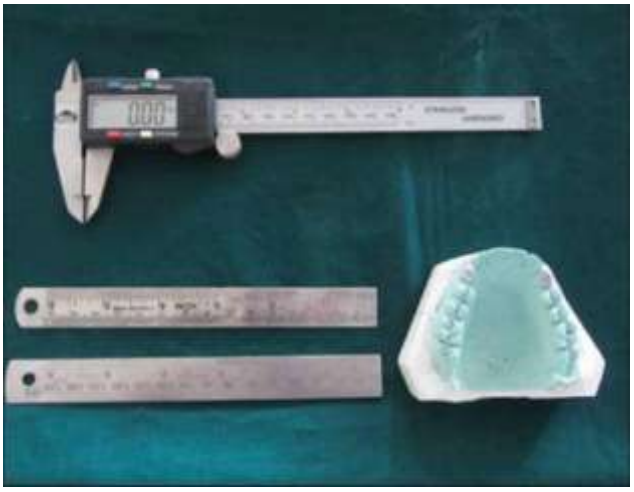
Figure 1: Measuring method according to Habets et al.[11]

The outline of the condyle, the ascending ramus, and corpus of both sides were traced on acetate paper. On the tracing paper, line-A was drawn between the most lateral points of the condylar image (O1) and of the ascending ramus image (O2). Line-B was drawn tangent to the most superior part of the condyle. The vertical distance from line-B on the line-A to the O1 projected on the ramus tangent was measured. This distance was called the condylar height (CH). The distance between the O1 and O2 was called the ramus height (RH). To measure the condylar, ramal, and condylar-plus-ramal asymmetry, the following formula was used:

$$\text{Asymmetry index} = \frac{CH_{right} - CH_{left}}{CH_{right} + CH_{left}}$$

The arch dimensions on the models were measured using vernier callipers
Following points were marked and distance between them were measured :

- Mesiobuccal cusp tips of the maxillary molars of right and left side from the incisive papilla.
- Buccal groove of the mandibular molars of right and left side from the labial frenum.(the labial frenum was extended vertically upto the incisal edges and then the distance from buccal groove was measured)



3. Results

- Table 1 shows the mean Condylar height for right and left side. On the right side, in class II subdivision it was found 6.95 ± 0.67 which was lower compared to both Class I and Class II patients (7.06 ± 0.54 and 7.13 ± 0.49, respectively). These differences were found statistically insignificant by using One way ANOVA ($p>0.05$) On the left side, in class II subdivision this was found 6.64 ± 1.26 which was lower compared to both Class I and Class II patients (7.18 ± 0.55 and 7.02 ± 0.49, respectively). These differences were found statistically significant by using One way ANOVA ($p>0.05$)
- Table 2 shows the mean ramal height for right and left side. On the right side, in class II subdivision it was found 44.55 ± 3.61, which was greater than both Class I and Class II patients (42.45 ± 2.48 and 42.09 ± 2.38, respectively). On the left side in class II subdivision was found 43.43 ± 3.29, whichwas greater than both Class I and Class II patients (42.44 ± 2.47 and 42.22 ± 2.06, respectively). These differences were found statistically highly significant by using One way ANOVA ($p<0.01$)
- Table 3 shows the mean asymmetry index of condylar height; in class II subdivision it was found 0.09 ± 0.05, whereas in both Class I and Class II patients it was 0.04 ± 0.03 whichwas lower than Class II subdivision patients. These differences were found statistically highly significant by using One way ANOVA ($p<0.01$).
- Table 4 shows the mean asymmetry index of ramal height for right side; in class II subdivision was found 0.02 ± 0.01, whereas in both Class I and Class II patients it was 0.01 ± 0.01 whichwas lower than Class II subdivision patients. These differences were found statistically highly significant by using One way ANOVA ($p<0.01$).
- Table 5 shows the mean distance from mesio-buccal cusp tip of maxillary first molar to incisive papilla in right and left quadrants. In the right quadrant of class II subdivision, this mean distance was found to be 36.22 ± 1.57 which was slightly lower compared to both Class I and Class II patients (36.28 ± 1.49and 36.32 ± 1.48, respectively). While in left quadrant, in class II subdivision it was found to be 33.40 ± 2.43 which was slightly higher compared to both Class I and Class II patients (32.90 ± 2.38and 33.02 ± 2.37, respectively). These differences were found statistically insignificant by using One way ANOVA ($p>0.05$)

- Table 6 shows the mean distance from buccal groove of mandibular first molar to labial frenum in right and left quadrants. In the right quadrant in class II subdivision, this mean distance was found 35.08 ± 1.24 which was slightly lower compared to both Class I and Class II patients (35.14 ± 1.29and 35.26 ± 1.07, respectively). In the left quadrant in class II subdivision this distance was found 32.48 ± 2.13 which was slightly higher compared to both Class I and Class II patients.

Table 1: Comparison of ch in different groups by using One way ANOVA

		N	Mean	Std. Deviation	Std. Error	F value right	F value left	p-value right	p-value left
Class I	Right	50	7.06	0.54	0.08	1.252	5.417	0.289	0.005*
	Left	50	7.18	0.55	0.08				
Class II	Right	50	7.13	0.49	0.07				
	Left	50	7.02	0.49	0.07				
Class II subdivision	Right	50	6.95	0.67	0.10				
	Left	50	6.64	1.26	0.18				
Total	Right	150	7.05	0.57	0.05				
	Left	150	6.95	0.87	0.07				

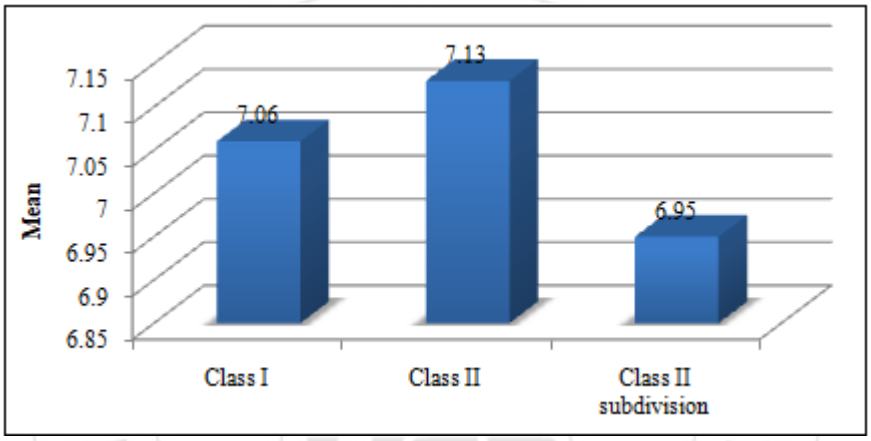


Table 2: Comparison of rh in different groups by using One way ANOVA

		N	Mean	Std. Deviation	Std. Error	F value right	F value left	p-value right	p- value left
Class I	Right	50	42.45	2.48	0.35	10.669	2.949	0.001*	0.049*
	Left	50	42.44	2.47	0.35				
Class II	Right	50	42.09	2.38	0.34				
	Left	50	42.22	2.06	0.29				
Class II subdivision	Right	50	44.55	3.61	0.51				
	Left	50	43.43	3.29	0.46				
Total	Right	150	43.03	3.06	0.25				
	Left	150	42.70	2.69	0.22				

Table 3: Comparison of ai-ch in different groups by using One way ANOVA

	N	*Mean*	*Std. Deviation*	*Std. Error*	*F value*	*p-value*
Class I	50	0.04	0.03	0.00	18.921	0.001*
Class II	50	0.04	0.03	0.00		
Class II subdivision	50	0.09	0.05	0.01		
Total	150	0.06	0.04	0.00		

Table 4: Comparison of ai- rh in different groups by using One way ANOVA

	N	*Mean*	*Std. Deviation*	*Std. Error*	*F value*	*p-value*
Class I	50	0.01	0.01	0.00	25.117	0.001*
Class II	50	0.01	0.01	0.00		
Class II subdivision	50	0.02	0.01	0.00		
Total	150	0.02	0.01	0.00		

Table 5: Comparison of 6-ip-urin different groups by using One way ANOVA

		N	*Mean*	*Std. Deviation*	*Std. Error*	*F value right*	*F value left*	*p-value right*	*p- value left*
Class I	Right	50	36.28	1.49	0.21	0.055	0.595	0.946	0.553
	Left	50	32.90	2.38	0.34				
Class II	Right	50	36.32	1.48	0.21				
	Left	50	33.02	2.37	0.34				
Class II subdivision	Right	50	36.22	1.57	0.22				
	Left	50	33.40	2.43	0.34				
Total	Right	150	36.27	1.50	0.12				
	Left	150	33.11	2.39	0.19				

Table 6: Comparison of 6-ip-lrin different groups by using One way ANOVA

	N	*Mean*	*Std. Deviation*	*Std. Error*	*F value*	*F value left*	*p-value right*	*p- value left*
Class I	50	35.14	1.29	0.18	0.289	0.651	0.749	0.523
	50	32.06	1.74	0.25				
Class II	50	35.26	1.07	0.15				
	50	32.18	1.79	0.25				
Class II subdivision	50	35.08	1.24	0.18				
	50	32.48	2.13	0.30				
Total	150	35.16	1.20	0.10				
	150	32.24	1.89	0.15				

4. Discussion

The reproducibility of vertical side-to-side measurements on OPG is acceptable if the patient's head is positioned properly in the equipment. Habets et al[11] suggested that when a clinical orthopantomograph is to be evaluated, the headholder must be fixed well to the OPG machine, and the head has to be well centered in the headholder. In the current study, all the films were taken in ideal conditions and inadequate or poor quality films were excluded.

Previous studies used 2-dimensional radiographs and found significant dental asymmetries i.e either the distal position of the mandibular first molar on the Class II side or mesial position of the maxillary first molar [2, 5, 8, 13]. In this study measurements were done on dental cast models for evaluating dental asymmetries which were found to be statistically insignificant.

While few researchers have also found skeletal asymmetries in their study[10, 14, 15] using different imaging modalities. In the present study, OPGs were used and analysed for skeletal asymmetries using the method described by Habets et al[11].

The condylar height of the left side in the class II subdivision group (6.64 ± 1.26) was statistically highly significant ($p<0.005$) from the condylar height of the control groups (class I and class II) indicating a form of skeletal asymmetry in the subdivision group when compared to the class I and class II groups. These results were similar to the results concluded by Sanders et al[10] that there is a presence of skeletal asymmetry of the mandible in class II subdivision groups although their imaging modality was CBCT. They found that the etiology of Class II subdivision malocclusions is primarily due to an asymmetric mandible that is shorter and positioned posteriorly on the Class II side. They concluded that the primary contributing factor of a Class II subdivision malocclusion was a deficient mandible on the Class II side, which accounted for 61% of the total molar discrepancy between the groups. On the Class II side, total mandibular length and ramus height were shorter, and the mandible was positioned posteriorly. The dental midline and chin point were also deviated toward the Class II side.

Janson et al[10] mentioned that skeletal asymmetries are more likely in the mandible, since most Class II subdivisions are type 1, with distal positioning of the mandibular first molar on the Class II side and a dental midline deviation also toward the Class II side. In the current study, there was no statistically significant dental asymmetry present in the class II subdivision group as compared to the control group. There was statistically highly significant ($p<0.001$) asymmetry in the ramal height of the right side of the subdivision group as compared to the control groups. The ramal height on the left side was also found to be statistically significant ($p<0.049$).

Habets et al[11] found that asymmetry index values greater than 3% must be taken into consideration as vertical asymmetries because of technical errors during film exposure. Kurt et al[17] in their study considered the same parameters in Class II subdivision and control groups. Although the condylar asymmetry indices were found above 3% indicating asymmetry, but the difference was statistically insignificant. In the current study, the asymmetry index ratios of condylar height and ramal height were found to be statistically significant. ($p<0.001$ for both)

5. Conclusion

Following were the conclusions of this study -

1) Condylar height of only one side was statistically significant (left side) in the class II subdivision group as compared to the control groups (class I and class II).
2) Ramal height of both sides was found to be statistically significant in class II subdivision group as compared to the control groups (class I and class II).
3) The asymmetry indices for condylar height and ramal height was also found to be statistically significant.
4) There was no significant dental asymmetry present in the subdivision group as compared to the control groups (class I and class II).

References

[1] Angle EH. Classification of the malocclusion. Dent Cosmos 1899; 41:248-64.
[2] Turpin DL. Correcting the Class II subdivision malocclusion. Am J Orthod Dentofacial Orthop 2005;128:555-6.
[3] Janson G, Carvalho PE, Canc¸ado RH, de Freitas MR, Henriques JF. Cephalometric evaluation of symmetric and asymmetric extraction treatment for patients with Class II subdivision malocclusions. Am J Orthod Dentofacial Orthop 2007;132:28-35.
[4] Janson G, Dainesi EA, Henriques JF, de Freitas MR, de Lima KJ. Class II subdivision treatment success rate with symmetric and asymmetric extraction protocols. Am J Orthod Dentofacial Orthop 2003;124:257-64.
[5] Janson GR, Metaxas A, Woodside DG, de Freitas MR, Pinzan A. Three-dimensional evaluation of skeletal and dental asymmetries in Class II subdivision malocclusions. Am J Orthod Dentofacial Orthop 2001;119:406-18.
[6] Sheats RD, McGorray SP, Musmar Q, Wheeler TT, King GJ. Prevalence of orthodontic asymmetries. Semin Orthod 1998;4:138-45.
[7] Smith RJ, Bailit HL. Prevalence and etiology of asymmetries in occlusion. Angle Orthod 1979;49:199-204.
[8] Alavi DG, BeGole EA, Schneider BJ. Facial and dental arch asymmetries in Class II subdivision malocclusion. *Am J Orthod Dentofacial Orthop.* 1988;93:38–46.
[9] Rose JM, Sadowsky C, BeGole EA, Moles R. Mandibular skeletal and dental asymmetry in Class II subdivision malocclusions. *Am J Orthod Dentofacial Orthop.* 1994;105: 489–495.
[10] Janson G, de Lima KJ, Woodside DG, Metaxas A, de Freitas MR, Henriques JF. Class II subdivision malocclusion types and evaluation of their asymmetries. *Am J Orthod Dentofacial Orthop.* 2007;131:57–66.
[11] Habets LL, Bezuur JN, Naeiji M, Hansson TL. The Orthopantomogram, an aid in diagnosis of temporomandibular joint problems. II. The vertical symmetry. *J Oral Rehabil.* 1988;15:465–471.
[12] Kambylafkas P, Murdock E, Gilda E, Tallents RH, Kyrkanides S. Validity of panoramic radiographs for measuring mandibular asymmetry. *Angle Orthod.* 2006;76:388–393.
[13] Alkofide EA. Class II division 1 malocclusions: the subdivision problem. J Clin Pediatr Dent 2001;26:37-40.
[14] Azevedo AR, Janson G, Henriques JF, Freitas MR. Evaluation of asymmetries between subjects with Class II subdivision and apparent facial asymmetry and those with normal occlusion. Am J Orthod Dentofacial Orthop 2006;129:376-83.
[15] Janson G, Cruz KS, Woodside DG, Metaxas A, de Freitas MR, Henriques JF. Dentoskeletal treatment changes in Class II subdivision malocclusions in submentovertex and posteroanterior radiographs. Am J Orthod Dentofacial Orthop 2004;126: 451-63.
[16] Sanders DA, Rigali PH, Neace WP, Uribe F, Nanda R. Skeletal and dental asymmetries in Class II subdivision malocclusions using cone-beam computed tomography. Am J Orthod Dentofacial Orthop2010;138:542.e1-20; discussion 542-3.
[17] Gokmen Kurt; Tancan Uysal; Yildiray Sisman; Sabri Ilhan Ramoglu. Mandibular Asymmetry in Class II Subdivision Malocclusion. *Angle Orthodontist, Vol 78, No 1, 2008.*