e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(7); 1213-1217

Original Research Article

Evaluation of Skeletal Pattern in Class II Subdivision and its Comparison with Class I- A Cephalometric Study

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Received: 20-0-2023 / Revised: 20-06-2023 / Accepted: 06-07-2023
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Conflict of interest: Nil

Abstract:

Objective: The purpose of the study was to use lateral cephalometric radiographs to ascertain the skeletal pattern of Class II subdivision subjects and to compare these with that of the Class I skeletal pattern.

Materials & Methods: Lateral cephalograms of 30 untreated Class II subdivision individuals and 30 subjects having Class I skeletal pattern were recorded in due course of time. These cephalograms were analyzed for evaluation and comparison of skeletal pattern of Class II subdivision individuals with Class I subjects.

Results: There was statistically significant difference in relation to sagittal parameters of Class II subdivision and Class I malocclusion subjects which demonstrated that skeletal pattern of Class II subdivision individuals was different from Class I. Class II subdivision individuals had more vertical growth pattern in comparison to skeletal Class I individuals.

Conclusion: The present study concluded that skeletal pattern of Class II subdivision individuals was different from Class I subjects. The mean values of most of the parameters were nearing towards Class II. Therefore for reaffirmation of their skeletal pattern, further study needs to be advocated to compare the skeletal pattern of Class II subdivision with Class II malocclusion subjects.

Keywords: Cephalometric, Class I, Class II subdivision, Malocclusion, Skeletal pattern.

Introduction

Unilateral Class II cases were described as subdivision by Angle.[1] He reported that a Class II relationship developed because of distal eruption of the mandibular first molar in relation to the normally positioned maxillary first permanent molar.1 Class II subdivision malocclusion are characterized primarily by distal position of mandibular first molar on Class II side and secondarily by mesial positioning of maxillary first molar on the Class II side in the apical base with normal asymmetry.[2,3,4]

In many subdivision patients the maxillary midline will be coincidental or show minimal deviation relative to clinical midline. However, the mandibular midline will be displaced towards the Class II side in faces with subclinical asymmetry.[5] The Class II subdivision with their asymmetric occlusal relationship often poses treatment difficulties. It is crucial to carefully diagnose asymmetries found in Class II malocclusion so they can be properly analyzed to determine the correct etiology and treatment protocol for malocclusion.[3]

Dental plaster casts often provide information on such midline shifts and molar relationship, however, an accurate appraisal of jaw relationship can only be determined radiographically, and not from dental casts alone. Plaster casts of teeth do not yield information relative to the extent of anteroposterior (or sagittal) and vertical jaw dysplasia, the axial inclination of incisor teeth, the angulation of occlusal plane, or balance of soft tissue facial contours. Lateral cephalometric radiographs are important in orthodontic growth analysis, diagnosis, treatment planning, monitoring of therapy, and evaluation of final treatment outcome.[6]

Most of the studies have been carried out using dental casts and frontal cephalograms to evaluate asymmetry, but very few studies have been reported to evaluate the skeletal pattern using lateral cephalograms in Class II subdivision.[7] The purpose of the present study was to evaluate the skeletal pattern in individuals with Class II subdivision malocclusion and its comparison with class I skeletal pattern using lateral cephalogram.

Material and Methods

A sample size of 60 was taken with 30 (Group A) having Class II subdivision malocclusion and 30 (Group B) with Class I occlusion. Lateral cephalograms for Class II subdivision patients were taken in due course of time from May 2014 to May 2015, and that of Class I were obtained from previous records in the department. These were then analyzed for evaluation of skeletal pattern using various cephalometric parameters as shown in Figure 1.

Criteria for selection of patients

Untreated Class II subdivision malocclusion subjects (Group A) were selected with following criteria:

- Full complement of permanent teeth up to the second molars.
- A complete Class I molar relationship on one side of the dental arch with a full cusp Class II relationship on the other side.
- No history of previous orthodontic treatment.
- No history of facial trauma or medical condition that might have altered growth.
- The absence of any severely mal-aligned or blocked out teeth.
- No lateral mandibular shift during closure as determined by clinical examination.

Results & Observations

The purpose of this study was to evaluate the dento-skeletal pattern in 30 subjects with class II subdivision malocclusion by comparing it with 30 subjects having skeletal Class I pattern using lateral cephalograms. The results of the study are tabulated in Table 1,2 and 3. Continuous data was recorded in the form of its mean and standard deviations. T-test was applied for statistical analysis of 2 groups. All the statistical tests were performed at a significance level of p value determined at 0.05 (*significant), 0.01 (**highly significant), and 0.001 (***very highly significant) level of confidence. Statistical analysis was conducted using IBM SPSS STATISTICS (version 22.0).

The mean difference for Posterior cranial base length (S – Ba) of Class II subdivision group and Class I group was -3.63 which was statistically highly significant (p-value .000). The mean difference for Maxillary length (ANS - PNS) was -3.70 and that of mandibular length (Co - Gn) was -5.30 which was statistically highly significant (p-value .000). Statistically significant difference was observed between mean values of SNA & ANB. The mean difference of the mandibular Protrusion (Pog – N perp) and facial angle (FH / N-Pog) was 6.36 and -2.90 respectively which was also statistically highly significant (p-value .000). Similarly, the values for Yen angle, Wits appraisal and Beta angle were found to be statistically highly significant (p-value ≤.002).

Table 1: The Mean, S.D and S.E.M of Group A

S. No.	Variable	Mean	S.D.	SEM
1.	S – N	75.03	3.80	0.694
2.	S –Ba	48.17	3.56	0.650
3.	N –S -Ba	128.80	5.20	0.951
4.	Ans - Pns	54.17	3.06	0.559
5.	Co -Pog	118.33	5.69	1.03
6.	Go –Pog Perp	77.90	4.64	0.848
7.	Co – Gn	120.07	6.50	1.18
8.	Ans-Pns:Go-Pog Perp	1.39	0.078	0.014
9.	Sna	82.43	3.36	0.614
10.	Snb	78.60	3.30	0.617
11.	Anb	3.17	0.747	0.136
12.	A –N Perp	0.67	1.53	0.281
13.	Pog –N Perp	0.70	3.73	0.682
14.	Fh –N Pog	86.10	2.61	0.478
15.	Sn-Mp	26.73	5.94	1.08
16.	Na –Me	122.33	6.90	1.26
17.	S – Go	83.50	6.58	1.20
18.	N – Ans	54.23	2.87	0.525
19.	Ans - Me	69.33	5.90	1.07
20.	Jaraback Ratio	67.86	5.52	1.00
21.	N – Ans %	43.90	2.15	0.393

22.	Ans – Me %	56.06	2.18	0.398
23.	Yen	117.90	3.91	0.714
24.	Wits	2.20	1.21	0.222
25.	Beta	28.60	3.20	0.584

Table 2: The Mean, S.D and S.E.M of Group B

S. No.	Variable	Mean	S.D.	SEM
1.	S – N	76.23	3.98	0.727
2.	S –Ba	51.80	3.48	0.633
3.	N –S -Ba	131.83	5.54	1.01
4.	ANS - PNS	57.87	3.57	0.653
5.	Co –Pog	123.33	6.11	1.11
6.	Go –Pog perp	81.07	4.13	0.755
7.	Co – Gn	125.37	6.15	1.12
8.	ANS-PNS:Go-Pog perp	1.35	0.090	0.016
9.	SNA	80.87	2.96	0.542
10.	SNB	79.20	3.08	0.564
11.	ANB	1.60	.675	0.123
12.	A –N Perp	0.933	1.83	0.335
13.	Pog –N perp	2.03	1.65	0.301
14.	FH –N pog	89.00	2.10	0.384
15.	SN-MP	25.07	5.27	0.964
16.	Na –Me	123.10	6.66	1.21
17.	S – Go	85.67	8.06	1.47
18.	N – ANS	57.17	3.24	0.593
19.	ANS - Me	67.43	5.93	1.08
20.	Jaraback Ratio	69.10	5.80	1.06
21.	N – ANS %	45.97	2.41	0.441
22.	ANS – Me %	53.73	2.92	0.534
23.	YEN	120.43	1.50	0.274
24.	WITS	1.73	0.583	0.106
25.	BETA	30.00	1.25	0.230

Table 3: Comparison between Group A and Group B

S. No.	Variable	Group A Mean	Group B Mean	Mean difference	95% Confidence Interval of the Difference		t value	P value
					Lower	Upper		
1.	S - N	75.03	76.23	-1.20	-3.21	0.811	-1.194	0.237
2.	S -Ba	48.17	51.80	-3.63	-5.45	-1.81	-3.99	0.000***
3.	N –S -Ba	128.80	131.83	-3.03	-5.81	-.253	-2.18	0.033*
4.	ANS - PNS	54.17	57.87	-3.70	-5.42	-1.97	-4.30	0.000***
5.	Co -Pog	118.33	123.33	-5.00	-8.05	-1.94	-3.27	0.002**
6.	Go –Pog perp	77.90	81.07	-3.16	-5.44	-0.893	-2.78	0.007**
7.	Co - Gn	120.05	125.37	-5.30	-8.57	-2.02	-3.24	0.002**
8.	ANS-PNS: Go-Pog perp	1.39	1.35	0.040	-0.004	-0.084	1.83	0.072
9.	SNA	82.43	80.87	1.56	-0.572	2.70	1.30	0.04*
10.	SNB	78.60	79.20	-0.600	-2.27	1.07	-0.718	0.476
11.	ANB	3.17	1.60	1.56	1.19	1.93	8.52	0.000***
12.	A –N Perp	0.67	0.933	0.766	-0.611	2.15	1.10	0.272
13.	Pog –N perp	0.70	2.03	6.36	4.15	8.5	5.70	0.211
14.	FH –N pog	86.10	89.00	-2.90	-4.12	-1.67	-4.73	0.00***
15.	SN-MP	26.73	25.07	1.66	-1.23	4.57	1.14	0.255

16.	Na -Me	122.33	123.10	-0.767	-4.27	2.74	-0.438	0.663
17.	S - Go	83.50	85.67	-2.16	-5.97	1.63	-1.14	0.259
18.	N - ANS	54.23	57.17	-2.93	-4.51	-1.34	-3.70	0.00***
19.	ANS - Me	69.33	67.43	1.90	-1.16	4.96	1.24	0.219
20.	Jaraback Ratio	67.86	69.10	-1.23	-4.16	1.69	-0.843	0.403
21.	N – ANS %	43.90	45.97	-2.06	-3.24	-0.884	-3.49	0.001**
22.	ANS – Me %	56.06	53.73	2.33	1.00	3.66	3.50	0.001**
23.	YEN	117.90	120.43	-2.53	-4.06	-1.00	-3.30	0.002**
24.	WITS	2.20	1.73	1.03	-0.026	0.959	1.89	0.048*
25.	BETA	28.60	30.00	-1.40	-2.65	-1.43	-2.22	0.032*

p = 0.05 (*significant), 0.01(**highly significant), and 0.001(***very highly significant)

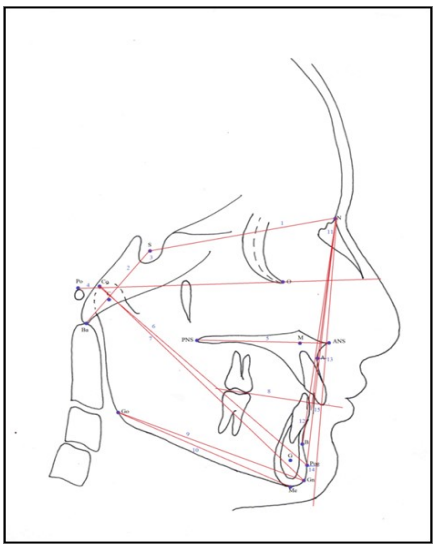

Figure 1: Cephalometric parameters

1.S-N; 2. S-Ba; 3.N-S-Ba; 4.FH Plane; 5.ANS-PNS; 6.Co-Pog; 7.Co-Gn; 9.Go-Gn; 10.Go-Me; 11.SNA; 12.SNB; 13.A-N perp; 14.Pog-Nperp; 15.Wits; 16.Yen angle; 17. Beta angle

Discussion

Class II subdivision is characterized by an asymmetrical posterior occlusal relationship in which the dental arch demonstrates a Class I relationship on one side and Class II relationship on other side.

The Class II subdivision malocclusion can be extremely challenging for diagnosis and treatment planning because of the difficulty in identifying the cause of malocclusion. The clinician must be able to identify the source of asymmetry in order to address the primary factor of malocclusion and achieve an optimal treatment results. When any midline deviation or an asymmetric occlusion is observed the clinician must check for skeletal asymmetries and dental asymmetries.

Janson et al [2] reported that the components that contribute to the asymmetric anterioposterior relationship in the Class II subdivision malocclusion were mainly dentoalveolar and the primary contributor to the differences between the Class II subdivision and the normal occlusion was the distal positioning of the mandibular first molar on the Class II side in the mandible without unusual skeletal or dental asymmetries. So, the purpose of our study was to use lateral cephalometric radiographs to ascertain the skeletal pattern of Class II subdivision subjects and to compare these with that of the Class I skeletal pattern.

The posterior cranial base length(S-Ba) showed statistically very highly significant difference between the two groups ($p \leq 0.001$) with length for Group A being smaller than Group B. The magnitude of the posterior cranial base length depends on posterior cranial base height and the position of the fossa.

Jarvinen et al [8] reported that posterior cranial base length is more in class II skeletal pattern as compared to class I skeletal pattern. Cranial base angle(N-S-Ba) also showed statistically significant difference with more acute mean value for Group A subjects. Anderson and Popovitch9 observed that the individuals with the larger cranial base angle showed a Class II tendency. Maxillary (ANS-PNS) and mandibular length (CO-Pog) showed very highly statistically significant difference demonstrating shorter lengths in Group A subjects than that of Group B subjects. The effective length of mandible was shorter in subdivision subjects.

The sagittal position of the maxilla (SNA) in Group A was more forward than that of the Group B sub-

jects. ($p \leq .05$) Similar finding was observed by Meloti A.F. et al [10] which also showed the SNA of the Class II subdivision group was larger than the Class I group. The SNB angle was small in the Group A subjects as compared to that of Group B subjects which represented that the mandible was positioned more retruded in Group A subjects, although this observation was statistically non-significant. Similar results were observed by Meloti A.F.[11] where the mean value of S-N-B angle for the Class II subdivision group was lower than the mean value of SNB angle for the Class I group.In the present study mean value of ANB angle for the Group A was larger than that of Group B which suggested that Group A subjects had more apical maxilla-mandibular difference. Same results were observed by Meloti A.F.[10] where the mean value of ANB angle for the Class II subdivision group was more than the mean value for Class I subjects. This difference was statistically very highly significant.

The Subdivision subjects had more acute facial angle than that of Class I subjects. The mandible of these patients was more retrognathic than that of the Class I subjects, though it was within the range of Down's (820-950) but mean value was less than that of Down (87.80).[11]

Further, Group A subjects had a more vertical growth pattern than Group B but the difference between the two groups was not statistically significant. The Group A subjects had increased lower anterior facial height as compared to that of Group B suggesting that subdivision patients had vertically directing growth pattern and had increased lower facial height. This may also be the reason that they have more posteriorly placed mandible. This was contradicting to a study by Jarabak and Siriwat [12] who found mean value of anterior facial height to be smaller for class II malocclusion in comparison to class I malocclusion.

Yen angle, Wits Appraisal and Beta Angle showed statistically significant difference among the two groups with the values nearing toward Class II skeletal pattern.

Conclusion

The present study concludes that skeletal pattern of Class II subdivision individuals is different from Class I subjects.

- There was statistically significant difference in relation to sagittal parameters of Class II subdivision and Class I skeletal pattern subjects which demonstrated that skeletal pattern of Class II subdivision individuals was different from Class I.
- Class II subdivision individuals had more vertical growth pattern in comparison to skeletal Class I individuals. The mean values of most of the parameters were nearing towards Class II. These results can further guide in proper treatment planning of Class II subdivision patients. Although for reaffirmation of their skeletal pattern, further study needs to be advocated with a much larger sample size.

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