

A CEPHALOMETRIC STUDY OF HARD TISSUE MORPHOLOGY IN NORMAL AND CLASS II DIV 1 MALOCCLUSION CASES – IN BANGALORE CITY

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Abstract

Aims & Objectives: The aim of the study was to evaluate the most common skeletal discrepancy which orthodontists treat in his daily practice.

Material & Methods: Material consisted of sixty cephalograms of thirty subjects with normal occlusion and thirty subjects with Angles class II div 1 malocclusion of age ranging from 10 to 14 years. The hard tissues were analysed in accordance with Steiner's method. 14 measurements (9 angular and 5 linear) were made. Data were statistically analyzed.

Results: The results obtained were compared to each other. The dento skeletal abnormality of Angles Class II Division I malocclusion cases had the maxillary base having normal relation to the cranial base whereas mandible was found to be retrognathic in relation to the cranial base being posteriorly positioned.

Conclusion: From this study the following can be concluded with regard to the skeletal abnormality the maxillary base was found to be having normal relation to the cranial base where as mandible was found to be retrognathic in relation to the cranial base by being posteriorly positioned.

Keywords: - Cephalogram, Class II Division I Malocclusion, Steiner's Cephalometric Analysis.

Introduction

The profile pattern has commanded the most attention, probably because it affects the appearance of the individual so much and is of major concern especially in orthodontic therapy. Since orthodontics is a problem of relationship with in the dento-facial complex. Most of the patients who come to the orthodontist with malocclusion are for better aesthetic value.

The first step in coming to a diagnosis is to classify the actual dental occlusion present. Dr. E.H Angle classified malocclusion in 1887 it was based upon the position of the first permanent molars and was intended to be a guide to treatment.

The key to orthodontic diagnosis is to recognise whether a skeletal problem exists, location of the disharmony and the degree of dysplasia. Cephalometric radiography is an important diagnostic tool in detecting these problems. If this is determined a more appropriate treatment can be developed.

Most of the patients who come to orthodontists in Bangalore city belong to Angles class II div 1 type of malocclusion and it represents approximately 15 to 20 % in general population and 49 % in clinical population²⁶.

Angles class II div 1 is characterized by more or less narrowing of the upper arch and protruding upper incisors, increased over jet and overbite. The skeletal relationship may vary from class I to severe class II. These variations may be due to the variation in the position of the jaw and/

or variation in the jaw in relation to the cranial base. It is essential to make a careful assessment of all these features before making a plan for treatment.

The present study is conducted to analyse the common features existing among the Angles class II div 1 malocclusion cases in the Bangalore city, cephalometrically using Steiner's analysis to aid in the diagnosis and treatment planning.

Material

Material for this investigation consisted of sixty cephalograms of thirty subjects with normal occlusion and thirty subjects' with Angles class II div I malocclusion of age ranging from 10 to 14 years.

The criteria for the selection of the cases in normal occlusion were as follows: Angles class I molar relationship with normal overjet and overbite, with correct inter cuspatation and pleasing facial characteristics.

Subjects in class II div I group had the following characteristics: Bilateral disto occlusion of the molars by one premolar width, proclined upper anteriors with increased overjet and overbite.

For all these cases lateral cephalograms were taken and standard tracings were made of the osseous and dental structures. All angular measurements were made to the nearest 0.5 degrees and linear measurements were made to 0.5 mm.

Planes Used:-

SN plane, mandibular plane, occlusal plane, line NA, line NB, upper central incisor long axis, and lower central incisor long axis, EL, ES and SL.

Angles Used:-

SNA, SNB, SND, ANB, Upper 1 to NA, lower 1 to NB, upper 1 to lower 1, SN to occlusal plane, SN to mandibular plane.

Method

Analysis of the hard tissue profile was made using the SN plane as the plane of reference and the following measurements were made. Angle SNA to show the relation of maxilla to the cranium, angle SNB to indicate the relation of the mandible to the cranial base, angle ANB as a reading of the antero- posterior relationship of the maxilla to mandible. Angle formed by the upper 1 to NA to show the degree of proclination. Lower 1 to NB to show the degree of proclination. Angle formed by Upper 1 to lower 1 denotes the degree of procumbancy, angle formed by SN and occlusal plane to relate vertical height of the dentition anteriorly and posteriorly Go-Gn to angle SN. This angle gives the inclination of the mandible to the anterior cranial base and this angle registers vertical dysplasia.

L shows the anterior location of the mandible along the line SN and point E shows the posterior location of mandible along the line SN as measured from S.

E to L measurement shows the antero-posterior effective length of the mandible.

Linear measurement from the most labial point of the upper central incisor to the line NA and from lower central incisor to line NB are also made

Readings

Sixty cephalograms, thirty from normal occlusion and thirty from angles class II div 1 subjects were analysed for each land mark mean, SD and coefficient of variation were calculated to denote the degree of percentage of variation of the individual observation from the mean value.

The test of statistical significance of the difference between mean, the t test was applied

Angular measurements

Angle SNA measurement in Angle class II div 1 patients was not significantly different from that of normal occlusion patients with the mean value of 82° and SD 2.97°

Angle SNB measurement in Angle class II div 1 patients was highly significant from that of normal occlusion patients with the mean value of 79.06° and SD 3.08°

Angle SND measurement in Angle class II div 1 patients was highly significant from that of normal occlusion patients with the mean value of 76.46° and SD 3.08°

Angle ANB measurement in Angle class II div 1 patients was highly significant from that of normal occlusion patients with the mean value of 2.9° and SD 0.9°

Angle lower1 to NB in Angle class II div 1 patient was highly significant from that of normal occlusion patients with the mean value of 23.86° and SD 5.19°

Angle upper1 to NA in Angle class II div 1 patients was not significantly different from that of normal occlusion patients with the mean value of 26.1° and SD 5.45°

The angle upper1 to lower1, Angle upper1 to NA in Angle class II div 1 patients was highly significant from that of normal occlusion patients with the mean value of 126° and SD 6.32°

The angle SN to occlusal plane in Angle class II div 1 patients was not significantly different from that of normal occlusion patients with the mean value of 15.7° and SD 4.12°

The angle SN to mandibular plane in Angle class II div 1 patients was not significantly different from that of normal occlusion patients with the mean value of 28.9° and SD 3.83°

Linear Measurements

The linear measurement E to L in class II div 1 is not significantly different from that of normal occlusion cases with mean value of 70.26mm and S.D 7.52mm

E to S in class II div 1 is moderately significant from that of normal occlusion cases with mean value of 28.8 and S.D 11.56 mm

S to L in class II div 1 is moderately significant from that of normal occlusion cases with mean value of 51.1 and S.D 9.88 mm

Upper 1 to NA L in class II div 1 is highly significant from that of normal occlusion cases with mean value of 3.16mm and S.D 1.79mm

Lower 1 to NB 1 is not significantly different from that of normal occlusion cases with mean value of 3.43mm and S.D 1.28mm

Highly significant measurement were found in class II div 1 cases as compare to normal occlusion cases with regard to the following measurements:-

Angles SNB, SND, ANB, angle upper 1 to NA, upper 1 to lower 1 and upper 1 to NA in mm

Moderately significant values were linear measurements ES and SL.

Angle SNB in class II div 1 cases ($75.8 + 2.08$) is highly significant from that of normal occlusion cases ($79.53 + 2.1$)

Angle SND in class II div 1 cases ($73.53 + 2.1$) is highly significant from that of normal occlusion cases ($76.46 + 3.08$)

Angle ANB in class II div 1 cases (16.43 + 1.76) is highly significant from that of normal occlusion cases (2.9 + 0.9)

Angle upper 1 to NA in class II div 1 cases (31.36 + 6.6) is highly significant from that of normal occlusion cases (23.86 + 5.19)

Linear measurement of upper 1 to NA in class II div 1 cases (6.83 + 3.23mm) is highly significant from that of normal occlusion cases (3.16 + 1.79 mm)

Angle upper 1 to lower 1 in class II div 1 cases (115.06 + 10.76) is highly significant from that of normal occlusion cases (126 + 6.32)

The linear measurement E to S in class II div 1 is moderately significant (21.9 + 8.0) from that of normal occlusion cases (28.8 and S.D 11.56 mm)

The linear measurement E to L in class II div 1 is moderately significant (48.56 + 8.62) from that of normal occlusion cases (51.10 + 9.88 mm)

Table 1: - Table showing comparison of the mean value of the present investigation to mean values of Steiner's.

Land Marks	Steiner's Normal	Present Investigation	
		Normal	Class II Div. 1
Angle SNA	82	82	81.56
Angle SNB	80	79.06	75.8
Angle SND	76	76.46	73.53
Angle ANB	2	2.9	6.43
Angle 1 to NA	22	23.86	31.36
1 to NA in mm	4	3.16	6.83
Angle 1 to NB	25	26.1	27.76
1 to NB in mm	4	3.43	5.4
Angle 1 to 1	131	126	115.06
Angle SN Occlusion	14	15.7	14.43
Angle SN to Mandibular Plane	32	28.9	28.8
EL in mm	73	70.26	70.46
ES in mm	22	28.8	21.9
SL in mm	51	51.1	48.56

Discussion

Cephalometrics is a quantitative measuring media for obtaining descriptive information on the dento-facial pattern at the time when the roentgenogram is obtained.

Through the use of cephalometrics, number of analysis has been developed to aid the practicing orthodontists in clinical evaluation and treatment planning for his patients.

The analysis followed in this study is adopted from the method proposed by Steiner's

With Steiner's analysis, the parents of the patients can be made to understand much more easily many of the problems involved. This is true because the tracings made by this, need a minimum number of lines for the purpose they serve and also because the readings and measurements are close to the area to be judged.

This investigation was done on 60 lateral cephalograms with 30 cases belonging to normal occlusion and 30 cases belonging to angles class II div 1 malocclusion.

In the analysis of each group, angular and linear measurement was studied. In each group, 14 measurements were made 9 angular and 5 linear measurements.

The angular measurements SNA, SNB and SND show the relationship of the maxilla and mandible to the cranium.

Angular measurement SNA showed no aesthetically significant difference in Angles Class II Division I in comparison to normal occlusion cases, indicating the normal positioning of the maxilla to the cranial base.

Dretich RC⁸ in his study found the maxilla larger in Angle's Class II, Division I cases.

Young M. Johnson, Smith C and Still M²⁵. Found maxilla more anteriorly placed in Class II, Division I cases But Riedel RA¹⁷ and Perry Hitchcock¹⁵ found no significant difference in relation of maxilla to the cranium in Class II Division I cases which is in accordance with the findings of this study.

Renfroe EW¹⁶. Found the maxilla posterior in Class II, Division I cases.

Angular measurements SNB and SND showed statistically significant difference indicating that the relationship of the mandible to the cranial base was posterior in Class II, Division I group from the normal and the subjects in this group showed that they had true skeletal Class II relationship.

Baldrige⁴ Renfroe¹⁶ Fisk and others¹⁰ Stuard Hunter²¹ Moyers¹⁴ and Dretich R.⁸ found the mandible posteriorly placed in Class II division I cases which are in accordance with this study.

Hitchcock P¹⁵ found the SNB angle smaller in Angles Class II, div I cases.

The angle ANB denotes that the relationship of the mandible to the maxilla, showed a highly significant difference between Class II, division 1 and normal cases, indicating the true skeletal Class II relationship. Haver TD et al¹¹ and Stuard Hunder²¹ also found angle ANB increased in Class II, Division I cases.

The angular measurement upper 1 to NA was increased in Class II Division 1 subjects from normal indicating the dental abnormality that is present on normal maxillary base. Salzmann¹⁸ Hoyers¹⁴ and Perry Hitchcock¹⁵ also found increased upper 1 to NA angle measurement. Fisk and others¹⁰ found the maxillary teeth placed anteriorly in the maxillary bone.

The angular measurement of lower 1 to NB was not statistically significant, Perry Hitchcock¹⁵ found similar values in both Class I and Class II Division I cases.

The degree of association between angular relationship of upper central incisor to lower central incisor and the angle of protrusion was tested significantly both in normal and Class II Division I and it was reduced in Class II Division I cases indicating the dental abnormality present. Salzmann¹⁸ and Johnson YM²⁵ also found reduction in this value.

The angular measurement SN to occlusal plane showed a moderately reduced value in Class II Division I cases.

Johnson YM, Smith C and Still M²⁵ found no significant difference in gonial angle.

Renfro EU¹⁶ in his study reported a smaller gonial angle in Class II, Division I patients.

The linear measurement of upper central incisor to NA was highly significant in Class II Division I subject from normal, indicating the dental abnormality present with normal maxilla. Salzmann¹⁸ Moyer¹⁴ and Perry Hitchcock¹⁵ also found increased upper 1 to NA measurement which is in accordance with the findings of this study.

The linear measurement of lower incisor to NB was moderately significant Perry Hitchcock¹⁵ found very little difference in S.D. values of Class I and Class II cases.

The linear measurement EL is not statistically significant indicating the normal length of the mandible.

Johnson YM, Smith C and Still M²⁵ found no significant difference in length of the mandible which is in accordance with these values of this study.

Linear measurements ES and SE are moderately significant indicating the posterior positioning of the mandible in relation to cranial base.

The findings of the present study which shows normal positioning of the maxilla to the cranial base, upper dental abnormality, skeletal Class II relation of the mandible to the maxilla, with the length of the mandible being normal and location of the mandible being posterior in relation to the cranial base. This is in general agreement with other previous investigations.

Conclusion

With the aim of comparing hard tissue morphology in case of normal occlusion and Class II Division I malocclusion. 30 cephalogram of each group were analyzed. The hard tissues were analyzed in accordance with Steiner's method. 14 measurements (9 angular and 5 linear) were made. Data were statistically analyzed. The results obtained were compared to each other (normal and Class II Division I) and with similar studies from other authors.

From this study the following can be concluded with regard to the dento skeletal abnormality of Angles Class II Division I malocclusion cases.

The maxillary base was found to be having normal relation to the cranial base whereas mandible was found to be retrognathic in relation to the cranial base being posteriorly positioned. Dental abnormality was found to be mainly with the upper incisors which were proclined, but the positioning of the lower incisors in relation to the mandibular plane was not significantly different from the normal cases.

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