Comparison of Incisor, Molar and Anterior Facial Height in Normal, Angle Class II Division 1 and Class III Malocclusion: A Cephalometric Study

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ABSTRACT

Objective: The purpose of this study was to compare incisor, molar and anterior facial height in normal, Angles Class II Division 1 and Class III malocclusion on lateral cephalograms.

Materials and methods: Sample consisted of total 60 lateral cephalograms of the patients between the age of 16 and 32 years comprised of 20 each of normal, Angles Class II Div 1 and Class III malocclusion.

Results: After studying specific landmarks and planes in the cephalograms, it was concluded that anterior facial height is significantly small in Class II Div 1, compared to normal and Class III. A fair degree of constancy of upper and lower face heights has been found in the study. It was also found that the upper molar height is contributory to increase and decrease in vertical proportions of face. Lower molar height can be related to the degree of overbite in Class II Div 1 case.

Keywords: Incisor height, Molar height, Anterior facial height.

INTRODUCTION

From the time immemorial, men have sought to solve the riddle of facial beauty and harmony through measurements and geometry. No part of human anatomy arouses so much interest as the face.

The most difficult diagnosis, because it is the least subjective, is that of esthetic balance of face. The sense of beauty is one acquired by education and environment. Therefore, it is variable with the same individual at different times and among individuals as it is related to geographic and cultural variations.

Soon after orthodontics was established to be a specialty, men attempted to classify malocclusions for better understanding and communication. Earlier classifications, which are still widely used, are defined in only the antero-posterior plane as this was supposed to be the balance of dentofacial complex. However, many anteroposterior imbalances are only symptoms, the cause of which is found in the vertical dysplasia.

Introduction of roentgenographic cephalometrics by HB Broadbent opened a new era in the field of orthodontics, prior to which, orthodontists had mainly to depend upon study casts clinical and intraoral periapical radiographic examination for diagnosis and treatment planning.

Vertical measurements in cephalometric analysis have received little attention because of large number of horizontal measurements, and few studies have been devoted directly to facial esthetics that would enable a person to distinguish which dimensions of face and teeth are responsible primarily for a pleasant or an unpleasant face. However the vertical relationships of jaws with the rest of the face have obvious clinical importance in cases of severe open bite and cases of deep bite.

The present study was done to compare, with the aid of cephalometry, the tooth height and anterior facial height in skeletonodental retrognathic (Angle Class II) skeletonodental prognathic (Angle Class III) and orthognathic (normal occlusion) cases, as these heights are directly responsive to treatment influences.

MATERIALS AND METHODS

The sample for the present study comprised of a total of 60 lateral cephalograms. These were obtained from the records of the Orthodontic Department, Government Dental College,
Bombay. The cephalogram comprised of 20 each of normal, Angle Class II Division 1 and Class III malocclusion. The sample was chosen at random. The age of the patients whose cephalograms were selected ranged from 16 to 32 years.

Following landmarks and planes were used in the study:

Landmarks and Planes for the Study of Tooth Height’s (Figs 1 to 4)

For the study of incisor and molar heights, following landmarks and planes were used:

1. The tip of the upper central incisor and the center of the chewing surface of first permanent molar.
2. The tip of the lower central incisor and the center of the chewing surface of first permanent molar.
3. The spina palatal plane.
4. The mandibular plane.
5. The perpendicular distances from incisors and molars to the respective planes in the jaws.

Following landmarks and planes were used for the study of anterior facial height:

1. Anterior nasal spine (ANS)
2. Gnathion (Gn)
3. Posterior nasal spine (PNS)
4. Pterygomaxillary (Ptm)

Planes used are as follows:

1. Palatal plane (pp)
2. The occlusal plane
3. The anterior skeletal plane (ASP)

RESULTS

Following results have been drawn from the comparison of tooth heights and anterior facial height in normal Angle’s Class II Division 1 and Class III cases.

1. Vertical proportions of face are quite variable and the total anterior facial height in Class II Division 1 is significantly less when compared to normal and Class III (Graph 1).
2. It is also found that lower facial height is significantly small in Class II Division 1 compared to normal and Class III cases (Graph 2).
3. Mean values found for the maxillary component of lower facial height were also found to be statistically significant when normal and Class II Division 1 and Class II Division 1 and Class III were compared (Graph 3).
4. Mean values of the mandibular component of lower facial height have been found to be statistical significant when normal and Class II Division 1 and Class II Division 1 and Class III were compared (Graph 4).
5. When comparing the tooth heights, maxillary molar height was found to be significant when normal and Class II Division 1 and Class II Division 1 and Class III were compared. It can be, therefore, concluded that maxillary molars contribute to the increase or decrease in vertical
proportions. Also, lower molar height was found to be significant in normal and Class II Division 1. This can be contributory factor in the causation of deep bite.

Because the relative heights of teeth are directly responsive to treatment influences, a thorough evaluation of these should be done in diagnosis and treatment planning.

DISCUSSION

Any biologic entity is a variable and homosapiens are no exception to it. The vertical proportions of face are of importance from diagnosis and treatment planning point of view. Herzberg² and Herbert³ have stressed the importance of facial proportions in the vertical plane. As, according to Sassouni⁴ and Nanda, anteroposterior imbalances are only the symptoms the cause of which is found in the vertical dysplasia.

There have been some cephalometric studies which gave only a cursory look at the study of face and dentition heights. On the other hand, normal subjects have been studied thoroughly in Western countries and standards laid down for them. These standards cannot be utilized for assessment and planning of treatment for Indian patients as these changes due to a number of factors like racial variations, genetics, nutrition body built and environment, etc.

Sheshadri⁵ calculated a figure of 109.95 mm in his study of Gujarati girls. The present mean value indicates that vertical proportions of face are variable even among subjects with Class II division 1 and that Gujarati females have short face compared to the normal value obtained in the present day.

The mean value for lower facial height (P-Gn) obtained in the present study is 67.65 mm for normal, 61.43 mm for Class II division 1 and 71.46 mm for Class III subjects. Jalali⁶ calculated a figure of 67.83 mm in adults with normal occlusion. The value obtained in the present study is close to the one found out by him.

Mathur⁷ reported mean values of 59.96 and 60.63 mm respectively for Gujarati and Maharashtrian girls with normal occlusion. When compared to the mean value in the present study, it is observed that Gujarati and Maharashtrian girls have a shorter lower face heights.

Mean value obtained for the maxillary component of lower facial height in normal, Angles Class II Division I and Class III
were 26.23, 23.58 and 27.28 mm respectively. These values were found to be statistically significant when normal occlusion and Class II Division I and Class III were compared. This shows that the height of the maxillary component in Class II Division I is less compared to normal and Class III.

Mean values obtained for the mandibular component of lower facial height were 40.93, 37.40 and 44.20 mm for normal, Class II Division I and Class III respectively. These values found to be statistically significant when Normal and Class II Division I, Class II Division I and Class III were compared from this, it is observed that the heightwise growth of mandible is less in Class II Division I cases. Mean value for Class III is more than that of the normal but not statistically significant.

Percentage of lower and upper facial heights in the present study have been found to be 53.69 and 46.39 in normal, 52.9 and 47.1 for Class II Division I and 56.05 and 43.95 for Class III. According to Wylie, lower face height should be 56.81%. The values obtained in the present study for normal is less than Wylie’s findings meaning thereby that Indians have smaller lower face height compared to the western population.

However, it is found that there is a fair degree of constancy of upper to lower face heights, especially the upper face height in all the three group studied. Broadbent states that after the pattern of face is established at the completion of deciduous dentition, there is no marked change in the proportions of face thereafter. However, Krogman proposes variation rather than constancy to be the rule, which has been found in the present study.

Mean values for dentition heights in normal were 28.60 and 42.95 mm for upper and lower incisor and 24.76 and 34.55 mm for upper and lower molars respectively. These values are close to the values established by Shaikh, who found these to be 26.81 and 42.11 mm for upper and lower incisors, and 21.74 and 32.93 mm for upper and lower molars respectively.

It has been a significant finding to note that the height of upper molar was found to be highly significant when normal and Class II Division I and Class III mean values were compared. It means, therefore, that upper molar height contributes to the increase or decrease the vertical proportion.

In the present study, when normal and Class II Division I mean values were compared, lower molar height was found to be significant. Prem Prakash and Margolis found that the degree of overbite is related to upper and lower molar heights, which concomitantly has been a finding in the present study as cases with Class II Division I which invariably present themselves with deep bite.

From the study, it was confirmed that vertical proportions of face are quite variable. Dentition heights can be used to diagnose the anomalies in the vertical height of denture like open and deep bite. Also, according to some workers, the relative vertical heights of teeth are directly responsive to treatment influences and, hence, a thorough evaluation of these should be done in diagnosis and treatment planning.

**CONCLUSION**

The study showed that the vertical proportions of face are quite variable. It was found that anterior face height is significantly small in Class II Division I compared to normal and Class III. A fair degree of constancy of upper and lower face heights has been found in the study, it was also found that the upper molar height is contributory to increase and decrease in the vertical proportions of the face. Lower molar height can be related to the degree of overbite in Class II Division I cases.

**REFERENCES**