# A Cephalometric Analysis of the Relationship Between Facial Pattern, Interincisal Angulation and Anterior Overbite Changes

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Many investigators have given consideration to the axial inclination of the incisors and have indicated some correlation between the position of these teeth and the individual facial pattern.[1,3,5,8,11,13,14,17] In 1953, Popovich[9] investigated local factors such as loss of teeth, length of teeth, degree of elevation of teeth, their mesiodistal movements, cusp heights, and angulation of incisors and molars to determine their correlations with the anterior overbite. He found that "the interincisal angle is highly correlated to the changes in the overbite in the Class II group, but this correlation drops considerably in Class I deep overbite group." He goes on to say, "In both of the deep overbite groups, the interincisal angle plays an important role in determining the degree of overbite."

In a previous paper an analysis was made of the cephalometric records of one hundred fourteen treated cases[6] in order to evaluate the effectiveness and stability of the anterior overbite reduction effected during treatment. Each case had at least 4 mm of overbite before treatment.

There seems to be some evidence to support the premise that the correction of a deep anterior overbite and the maintenance of this correction require that the interincisal angle be such as to inhibit the postretention tendency of relapse to or toward the original depth of the pretreatment incisal overbite. This problem is particularly evident in the treatment of cases requiring the retraction of maxillary incisors in Class II cases with or without the extraction of premolars.

Wylie[19] obtained results from clinical material comprising ninety cases which indicated a significant relationship between vertical overbite and total height of face, and showed that the total facial height diminishes with an increase in the depth of bite.

Björk[1] attempted to correlate the factors of vertical overbite, incisal inclination, and facial pattern from a random sample of Swedish children and conscripts. His sample was made up of 322 boys between the ages of 12 and 13 years, and 281 conscripts who had passed the age of 21, but were not yet 23. It is interesting to note that in the group of 12 year old boys, there were 8 Class III's included and in the group of conscripts, there were 26 Class III's. Björk measured the incisal overbite using the occlusal plane as a basis of reference. The occlusal plane was drawn as a line connecting the distobuccal cusp of the upper first molar to the tip of the maxillary incisor. The vertical overbite was measured by the distance that the tip of the lower incisor extended either above or below the occlusal plane.

Schudy[14] claimed to be introducing the OM angle. In his review of the literature, he states that Björk measured the angle formed by the occlusal plane and sella articular line in a study of 322 males of 12 years. However, in that same report,[1] the OM angle was also measured for the 322 boys. The angle was measured as 17.53° with a stan-

dard deviation of 4.80°. The OM angle was also measured for the 281 conscripts. In this group the angle was given in relationship to the degree of vertical overbite. For those having vertical overbite less than 2 mm, the OM angle was 18.33°. For those having a vertical overbite of more than 2 mm, the OM angle was 22.14°.

Björk wrote, "The inclination of the occlusal plane is unchanged relative to the cranial base. Owing to the intimate closure of the jaws in the first group, i.e., the group with the larger depth of bite, the angle between the mandibular base and the occlusal plane (OM angle) is considerably smaller than in the second group. The incisors of both jaws are more upright in the first group. The angle formed by the longitudinal axis of the medial incisors of the upper and lower jaws is thus 5.39, ±1.4° greater in the group with the larger depth of bite.

"No changes in the linear dimensions of the facial diagram were found, with the exception of a reduction in the total facial height, as measured from nasion to gnathion, in the group with the larger depth of bite. There is no change in the height of the upper part of the face from nasion to incision superior, nor in the frontal height of the lower jaw, from incision inferior to gnathion. Hence, the mechanics of increased depth of bite are as anticipated, that the jaws close more intimately causing the face to appear somewhat compressed."

The mean vertical overbite of Björk's sample of conscripts was approximately 2 mm with a standard deviation of approximately 2 mm. The range of his sample was from approximately 4 mm openbite to 8 mm overbite. The mean vertical overbite of his sample of boys was 2.7 mm with a range similar to the range of the conscripts. Therefore, we see that his sample not only included a great number of open-bite cases, but also a large number of cases which would be considered to have a normal overbite relationship. The difference between these measurements and Schudy's may be accounted for by the difference in technique of arriving at the occlusal plane. Schudy did not discuss his method of overbite measurement.

The sample used by Seipel[16] was broken up into six groups according to age and sex. There were males and females four, thirteen and twenty-one years old. The mean vertical overbite of these groups was 2.5 to 3.5 mm with a range and distribution fairly similar to those of Björk. Seipel could find no variation in the height of the upper jaw corresponding to variations in vertical overbite. He did find, however, that the mandibular incisors exhibited vertical displacement in relation to the Frankfort plane in cases of varying depth of bite. This distance diminishes as the depth of the bite increases.

Schudy[14] states, "The vertical overbite of the incisor teeth has been pointed out to vary directly with the OM angle and, therefore, with the inclination of the occlusal plane." In this same report he also said, "Since large interincisal angles are so consistently associated with excessive overbites, we may logically deduce that a large interincisal angle is a contributing cause of deep overbite."

The purpose of this investigation is to determine the extent, if any, of possible correlations between the facial pattern, axial inclination of the incisors, excessive incisal overbite, and postretention overbite relapse using pretreatment and postretention records in a sample limited to deep overbite cases.

## Materials

One hundred sets of tracings were made from selected cephalometric films

taken from the files of various orthodontists. Each set was composed of three films: (a) pretreatment, (b) at retention, and (c) postretention. The postretention period varied from two years to approximately eight years.

The selection was made on the basis of the following criteria:

1. The incisal overbite as measured from a line drawn perpendicular to the facial plane had to be five mm or more.
2. A satisfactory treatment result as seen on cephalometric film, viz.:
   a. Class II molar relationship had to be fully corrected to a Class I.
   b. Retention film had to indicate satisfactory overbite reduction.
   c. Final film had to indicate that no retaining device was still in use.
   d. Maxillary and mandibular incisors had to be in contact relationship in the final film.
3. The final film had to be taken at least two years postretention.

## Method

In the various studies of anterior overbite, several different methods have been used to arrive at a measurement of this condition. Essentially, these measurements were derived from plaster casts or from cephalometric films. It would seem that the use of plaster casts for measurements offers little that is not available through the use of cephalometric films.

The facial plane, as used by Prakash and Margolis,[10] was used in this study as a basis for the measurement of the incisal overbite. Although the position of nasion and pogonion may change during the treatment and postretention periods, the actual change in inclination of the facial plane is not sufficient to significantly alter the overbite measurement.[4] Realistically, an evaluation of

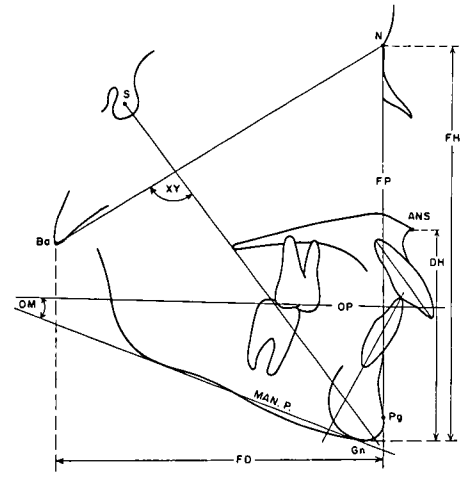


Fig. 1

the extent of incisal overbite is subjective and therefore it was decided to relate it to the facial plane. Perpendicular lines dropped from the facial plane to the incisal edges of the maxillary and mandibular incisors afforded an accurate measurement of the vertical component of the incisal overbite. Measurements were made to the closest 0.5 mm. Individual facial patterns were determined by the ratio of facial height to facial depth. Facial height was established along the facial plane from nasion to gnathion. Facial depth was established along a plane perpendicular to the facial plane extending to basion. Basion was used according to Coben,[2] "as representative of the posterior limit of that segment of the cranial base which may influence facial development." The dental portion of facial height was limited to the distance between gnathion and the anterior nasal spine parallel to the facial plane (Fig. 1). This measurement was used in establishing a dental height-depth ratio. The inclinations of the maxillary and mandibular incisors as related to the facial plane, as well as the total interincisal angle were measured (Fig. 2). In order to discuss the work of

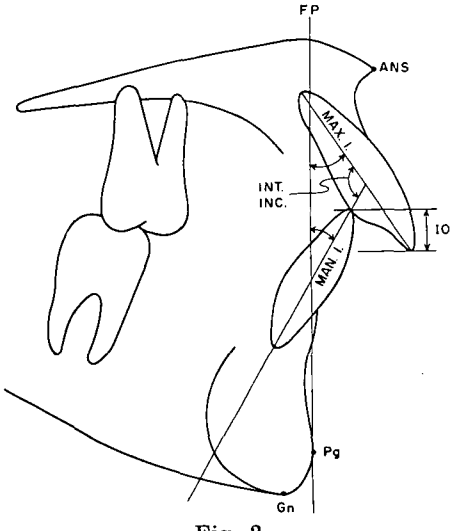


Fig. 2

Schudy,[14,15] the OM angle was also measured in the pretreatment records.

A graphic presentation was used to show the correlations, if any, between the accumulated data in order to present the material in such a way that tendencies or trends would be visually apparent. The arrangement of these measurements according to ascending value was the first step in creating a basis for correlation. In each case this information was then transferred to a graph.

After establishing the dental height-depth ratio curve, it was used as a basic referrent for correlation of the other variables. Each variable was assigned a separate graph. It was then plotted on the graph according to the position of the individual case on the dental height-depth ratio curve. In that way, a relationship could be seen at a glance between the dental height-depth ratio curve and any given variable.

## Discussion of Method

The first problem to be resolved in this investigation was the establishment of some standard for evaluating the facial pattern of the individual patient.

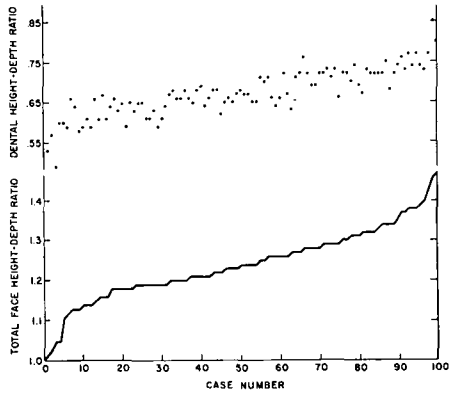


Fig. 3

The initial thought was to establish a ratio between the total face height and the facial depth. However, in an attempt to limit the area under investigation, it was decided to arrive at a ratio specific for the dental area. Therefore, the dental height-depth ratio was formulated and plotted against the total face height-depth ratio to determine the correlation (Fig. 3). It was noted that the general trend of the scatter thus formed by the dental height-depth ratio was not quite as steep as the curve formed by the total face height-depth ratio. In order to determine the reason for this variation, the nasion-basion facial plane angle was plotted against the dental height-depth ratio (Fig. 4). This graph

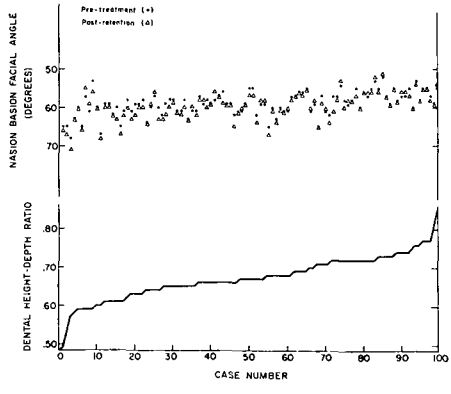


Fig. 4

showed that there was a slight tendency for a decrease in the nasion-basion facial angle going from the short to the long face. Since the facial plane is a common factor in the height-depth ratio, and in the nasion-basion facial angle, it would seem that the tendency toward a decreased angle would be attributable to the uprighting of the nasion-basion plane as the face gets longer.

Since the vertical dimension of the face was measured along the facial plane, and this plane was used as a basis for overbite measurement, it seemed consistent that the axial inclination of the incisors be determined in relation to the facial plane.

## Findings

### *Correlation of Mandibular Incisal Inclination*

An evaluation of the pretreatment and postretention measurements plotted against the dental height-depth ratio indicates that there is little significant difference to be found in these measurements in relationship to the facial pattern. To check this impression, mean inclinations of the shorter faces (first 50 cases) were compared to the mean inclinations of the longer faces (last 50 cases) (Fig. 5).

### *Correlation of Maxillary Incisal Inclination*

An evaluation of the scatter formed by the plotting of the maxillary incisor inclination values on this chart gives the impression that there is little significant difference in the maxillary incisor inclinations as related to the range of facial patterns (Fig. 6).

### *Correlation of Interincisal Angulation*

Since individual measurements of the mandibular or maxillary incisor inclinations do not tell anything about their relationship, it seemed essential that the interincisal angulations be evaluated.

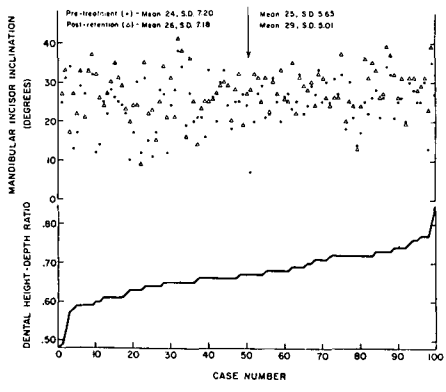


Fig. 5

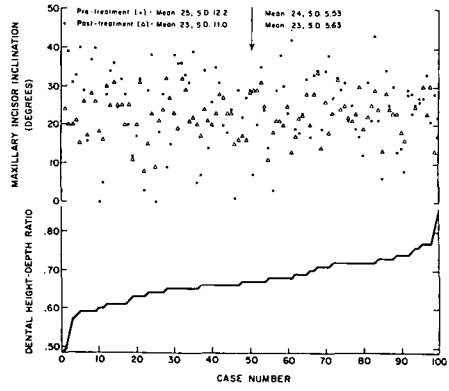


Fig. 6

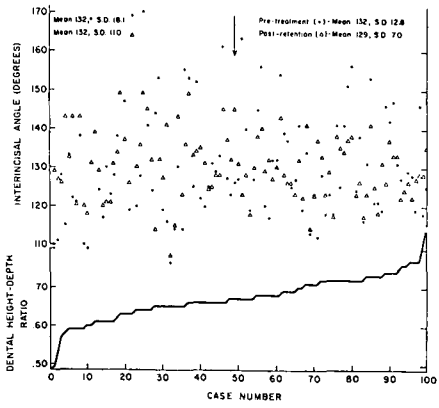


Fig. 7

After these data had been plotted on the chart against the dental height-depth ratio, it became evident that there was no significant correlation be-

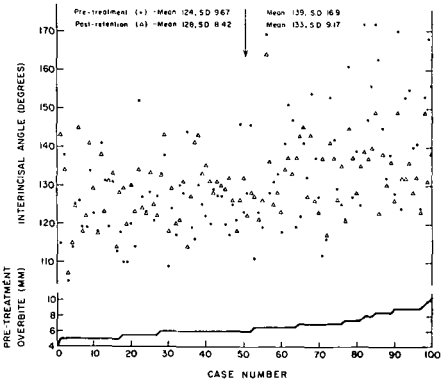


Fig. 8

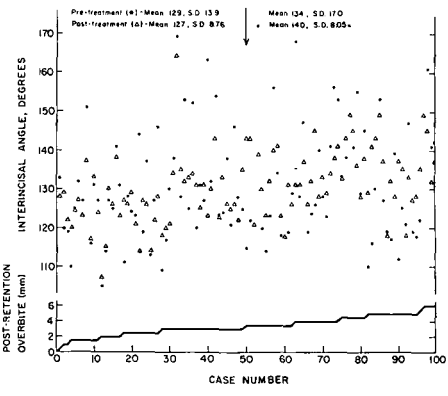


Fig. 9

tween the interincisal angulation and the dental height-depth ratio (Fig. 7).

*Correlation of Overbite Factors to Dental Height-Depth Ratio*

In order to determine whether any relationship existed between a facial pattern and the vertical overbite, various overbite factors were plotted on a graph against the dental height-depth ratio. The overbite factors were divided into five groups: (1) pretreatment overbite, (2) treatment overbite reduction, (3) overbite at retention, (4) postretention relapse, and (5) postretention overbite. The distribution thus established seemed to give no suggestion of correlation to variations in the facial pattern.

*Correlation of Interincisal Angulation with Pretreatment Overbite*

In order to determine the relationship between the pretreatment overbite and the interincisal angulation, this information was plotted on a graph. The cases were arranged in an ascending order of pretreatment overbite, going from the lowest overbite on the left to the highest on the right. The corresponding pretreatment and postretention interincisal angulations were then plotted against this overbite curve. Examination of the scatter thus formed seemed to indicate a slight increase in the pretreatment and postretention interincisal angulations as the pretreatment overbite increased (Fig. 8).

*Correlation of Interincisal Angulation with Postretention Overbite*

A referrent curve similar to the one in the previous correlation was established by arranging the cases according to the postretention overbite in an ascending order from left to right. The pretreatment and postretention interincisal angulations were then plotted according to their respective positions on the postretention overbite curve. This scatter also seemed to indicate a tendency for the interincisal angle to increase as the overbite increased (Fig. 9).

## Discussion

One of the problems inherent in any investigation involving incisal overbite is the determination of qualitative and quantitative standards for evaluating what constitutes a deep overbite. When is an overbite a deep or abnormal overbite? Magill's interpretation of his findings was "that the overbite results were better in the ten cases with the deepest original overbites than in the group of a similar number with the least original overbites."[7] It seems that in making this kind of evaluation, we must consider the range of overbite

measurements in normal incisal relationships. Steadman[18] indicated that, in his study of acceptable occlusion models, the average overbite was 3.1 mm with two-thirds of the sample lying between 1.2 and 5 mm. Since in the correction of overbite the tendency is, or should be, to overtreat, we would not only expect but hope for relapse in the direction of what would be normal for the individual case. Thus, in the cases with a small initial overbite, although the actual amount of relapse is less than in those cases with a large initial overbite, when compared with the total reduction, the percentage becomes misleading. According to Steadman's findings, approximately one-quarter of the sample of cases used by Magill to arrive at his conclusions would actually fall within a range of average acceptable overbite.

Schudy,[14] in his investigation of four hundred malocclusions, formed two smaller subgroups on the basis of the size of the angle formed by the occlusal and mandibular planes. These two groups represented the two extremes of the OM angle. Group II included those cases with an OM angle above 20°, and Group III included cases having angles below 11°. On the basis of this grouping, Schudy concluded, "The average vertical overbite was found to be twice as great in Group III as in Group II. This suggests that vertical overbite is to a significant degree dependent upon facial morphology." It must be noted here that the range of overbite represented in this group of four hundred malocclusions extended from 4 mm openbite to 10 mm overbite with a mean of 3.8 mm. Therefore, his subgroup II included a majority of open-bite cases. Can we come to valid conclusions concerning the relationship of overbite to facial pattern when the sample is loaded with open-bite cases? Again, Schudy[15] states, "The results of a previous study lead to the belief that

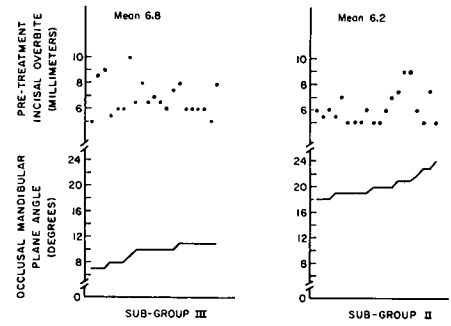


Fig. 10

there is a significant correlation between the overbite and the OM angle." He also comes to further conclusions concerning the relationship of overbite with facial patterns on the basis of the one hundred twenty cases divided into three groups as follows: "The average overbite was 3.5 mm in the average group; 2.9 mm in the retrognathic group; and 5.03 mm in the prognathic group." There is no indication given concerning the method of measurement in arriving at these figures. In any case, it seems that most of these overbite values could very readily fall within the normal limits of acceptable overbite. On the basis of this sample, Schudy concludes, "We found that deep overbites are associated with extreme prognathia and mild overbites or openbites are associated with retrognathia. We also found that deep overbites are associated with low OM angles and vice versa."

To test this premise using our sample of cases, it was decided to set up subgroups similar to those used by Schudy. The only difference was that both of our subgroups were in the deep overbite range. However, they were at the extremes of the sample (Fig. 10). Since my sample was smaller than Schudy's, the limits of the OM angle had to be extended in order to have a significant number of cases at each end. Therefore, twenty cases were selected with OM angles above 18° and placed into

Group II. Twenty-one cases were selected with OM angles less than 11° and were put into Group III. The pretreatment overbite for these cases was then plotted. It was found that the mean overbite in Group II was 6.2 mm and the mean overbite in Group III was 6.8 mm. According to this sample, the difference in overbite between the low OM angle group and the high OM angle group is not sufficient to justify any serious distinction between the two on this basis.

Since the selection of cases for this investigation was limited by the requirement that each must have at least 5 mm overbite pretreatment, it is obvious that we are not dealing with a random selection. In spite of this limitation the sample still demonstrates an adequate range of facial patterns. According to Ricketts' X-Y angle,[12] the range extends from —5° to +13.5°. Using the OM angle, the range extends from 7° to 24°. Using the dental height-depth ratio, the range extends from 49 to 85%.

Although apparently there is little correlation between incisal angulation and the facial pattern, there does seem to be a suggestion of correlation between the interincisal angulation and the overbite relationship. The pretreatment records (Fig. 8) indicate that the cases with the least pretreatment overbite have the smaller mean interincisal angle, while the cases with the greatest pretreatment overbite have the larger mean interincisal angulation. The postretention records (Fig. 9) indicate that those with the least overbite had a small mean interincisal angle initially, while those cases having a greater postretention overbite had a larger mean interincisal angulation initially. From this information it would seem that there might be some correlation between the interincisal angulation and the overbite relationship. We might conclude that, as the incisal overbite becomes deeper, the interincisal angulation tends to become greater. However, the corollary is not necessarily true. We may not assume that the existence of a large interincisal angle brings with it a deep overbite. Since we are dealing with small changes in mean values, it might be misleading to arrive at conclusive generalities. In any case, a clear cause and effect relationship might be difficult to prove.

It must be kept in mind while considering the angulations of incisors and their relationships to overbite, that there are many other factors influencing the total picture. The pretreatment incisal inclinations are influenced to a great extent by the musculature, in such a way as to increase or decrease the inclination in proportion to the direction, intensity, and frequency of force being applied. We must also be careful not to overlook the relationship between overbite and overjet, since one is generally related directly to the other. We are not likely to find extensive relapse of overbite if there is good continuity of both arches, and an ideal intercuspal relationship of all posterior segments. If these ideal conditions exist, it would seem that the amount of overbite that would develop would be dependent on tooth size relationship, more so than any other factor. In any given case, if all factors were equal except the interincisal angulation, this in itself would tend to show a difference in the overbite, due to the method of measuring this quantity. This was demonstrated very well by Magill.[7]

## Statistical Analysis

In order to investigate to the fullest extent the significance of the accumulated data, it was decided to subject these to a statistical analysis. Since we were primarily interested in possible correlations between the various factors discussed, an electronic computer was

CHART I

| Variables Correlated | Correlation Coefficients | Variables Correlated | Correlation Coefficients |
|---|---|---|---|
| X-Y Angle – $\frac{FH}{FD}$ | .89 | Treatment Overbite Reduction – $\frac{DH}{FD}$ | .01 |
| $\frac{DH}{FD} - \frac{FH}{FD}$ | .89 | Overbite at Retention – $\frac{DH}{FD}$ | .01 |
| Na B F Plane Angle – $\frac{DH}{FD}$ | .56 | Postretention Relapse – $\frac{DH}{FD}$ | .03 |
| X-Y Angle – $\frac{DH}{FD}$ | .78 | Postretention Overbite – $\frac{DH}{FD}$ | .04 |
| $\overline{\vert}$ Angle Pretreatment – $\frac{DH}{FD}$ | .15 | $\frac{\vert}{\vert}$ Angle Pretreatment – Pretreatment Overbite | .52 |
| $\overline{\vert}$ Angle Postretention – $\frac{DH}{FD}$ | .11 | $\frac{\vert}{\vert}$ Angle Postretention – Pretreatment Overbite | .26 |
| $\frac{\vert}{-}$ Angle Pretreatment – $\frac{DH}{FD}$ | .13 | $\frac{\vert}{\vert}$ Angle Pretreatment – Postretention Overbite | .02 |
| $\frac{\vert}{-}$ Angle Postretention – $\frac{DH}{FD}$ | .01 | $\frac{\vert}{\vert}$ Angle Postretention – Postretention Overbite | .31 |
| $\frac{\vert}{\vert}$ Angle Pretreatment – $\frac{DH}{FH}$ | .03 | Pretreatment Overbite – OM Angle | .16 |
| $\frac{\vert}{\vert}$ Angle Postretention – $\frac{DH}{FH}$ | .12 | Postretention Overbite – OM Angle | .19 |
| Pretreatment Overbite – $\frac{DH}{FD}$ | .09 | $\frac{DH}{FD}$ – OM Angle | .59 |

used to arrive at correlation coefficients of the groups of variables. Correlation coefficients give an estimate of the joint variation of two variables.

Variables are said to be strongly correlated if the coefficient is near unity (in magnitude). Coefficients larger than 0.8 are considered significant, those between 0.75 and 0.8 are suggestive (indicating more study might be worthwhile), and those below 0.7 are usually insignificant. The correlation coefficients for the variables correlated in this study are listed in Chart I.

As may be seen, there was no indication of significant correlation to be found in comparing any of the variables listed except for the correlation between the X-Y angle and the face height-depth ratio, and between the dental height-depth ratio and the face height-depth ratio. High correlations would be expected here since essentially the same relationships were measured. Although the correlation coefficient between the X-Y angle and the dental height-depth ratio was lower, there was still indication of significance. This seemed to bear out the premise made earlier that the X-Y angle is a more valuable diagnostic tool for the total facial pattern than for the dental area. Although the graphs in Figures 8 and 9 seem to indicate some correlation between the overbite factors and the interincisal angulation, the coefficients for these variables do not indicate any significant correlation. It might also be noted that the correlation coefficient for the relationship of the dental height-depth ratio and the OM angle is not significant.

## Conclusions

1. In this sample, composed of one hundred cases having pretreatment overbites of 5 mm or more, there was little or no correlation between the facial pattern of the individual based on a dental height-depth ratio and the following factors:
   a. Pretreatment and postretention angulation of the mandibular incisors.
   b. Pretreatment and postretention angulation of the maxillary incisors.
   c. Pretreatment and postretention interincisal angulation.
   d. Overbite measurements.
2. Correlations made from the graphs of the pretreatment and postretention interincisal angulations and the pretreatment and postretention overbites indicated that there might be a suggestion of a correlation between the interincisal angulation and the overbite relationship.
3. A statistical analysis of the data of this sample indicated that there was no significant correlation between the variable factors concerned with overbite, facial pattern, and incisal inclination.
4. A high correlation was demonstrated between the total face height-depth ratio and dental height-depth ratio.
5. In the diagnosis and treatment planning of cases involving deep overbite, it would seem advisable to consider, in addition to the interincisal angulation, the many other factors which may play a role in the maintenance of a corrected interincisal relationship.

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REFERENCES

1. Björk, A.: *The Face in Profile.* Sv. Tandl. Tidskr., 40: 5, 1947.
2. Coben, S. E.: The Integration of Facial Skeletal Variants. *Am. J. Ortho.*, 41: 409, 1955.
3. Downs, W. B.: Analysis of the Dento-Facial Profile. *Angle Ortho.*, 26: 191, 1956.
4. Goldstein, M. S., and Stanton, F. L.: Various Types of Occlusion and Amounts of Overbite in Normal and Abnormal Occlusion Between 2 and 12 Years. *Int. J. Ortho.*, 22: 549, 1936.
5. Graber, T. M.: Clinical Cephalometric Analysis. *Vistas in Orthodontics,* Philadelphia, Lea and Febiger, 1962, p. 173.
6. Ludwig M.: Analysis of Anterior Overbite Relationship Changes During and Following Orthodontic Treatment. *Angle Ortho.*, 36: 204, 1966.
7. Magill, J. M.: Changes in the Anterior Overbite Relationship Following Orthodontic Treatment in Extraction Cases. *Am. J. Ortho.*, 46: 755, 1960.
8. Margolis, H. I.: A Basic Facial Pattern and Its Application in Clinical Orthodontics. Part I. Maxillo-Facial Triangle. *Am. J. Ortho.*, 33: 631, 1947.
9. Popovich, F.: Cephalometric Evaluation of Vertical Overbite in Young Adults. *Canad. Dent. Assoc. J.*, 21: 209, 1955.
10. Prakash, P., and Margolis, H. I.: Dento-Craniofacial Relations in Varying Degrees of Overbite. *Am. J. Ortho.*, 38: 657, 1952.
11. Ricketts, R. M.: Planning Treatment on the Basis of the Facial Pattern and an Estimate of its Growth. *Angle Ortho.*, 27: 14, 1957.
12. Ricketts, R. M.: A Foundation for Cephalometric Communication. *Am. J. Ortho.*, 46: 335, 1960.
13. Sassouni, V.: Position of the Maxillary First Permanent Molar in the Cephalometric Complex. *Am. J. Ortho.*, 43: 496, 1957.
14. Schudy, F. F.: Cant of the Occlusal Plane and Axial Inclinations of Teeth. *Angle Ortho.*, 33: 69, 1963.
15. ————: Vertical Growth Versus Anteroposterior Growth as Related to Function and Treatment. *Angle Ortho.*, 34: 75, 1964.
16. Seipel, C. M.: Variation of Tooth Position. *Sv. Tandl. Tidskr.*, 1946, Suppl. 36.
17. Steadman, S. R.: Six Different Kinds of Overbites. *J. Am. Dent. A.*, 27: 1060, 1940.
18. ————: The Relation of Upper Anterior Teeth to the Lower Anterior Teeth as Present on Plaster Models of a Group of Acceptable Occlusions. *Angle Ortho.*, 22: 91, 1952.
19. Wylie, W. L.: The Relationship Between Ramus Height, Dental Height, and Overbite. *Am. J. Ortho.*, 32: 57, 1946.