Orthodontic Case Analysis

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The many etiologic factors of malocclusion and infinite variations in the normal pattern of facial development frequently combine to make orthodontic problems complex. Case analysis includes an evaluation of the general factors affecting growth and the local factors which may affect the denture. Since treatment should be started during an active growth period, it is necessary to evaluate the existing relations of the denture to the face and to prognosticate the potential of future growth.

One of the first steps in case analysis is to observe the relations of the face by patient examination. Readily discernible and of particular interest are the mandibular plane, maxillary and mandibular base differences, disharmony in other components of the face, and the distribution and function of the musculature. The observing orthodontist will see and record a wealth of diagnostic information from this superficial examination.

To this is added the information from a case history, a study of plaster casts and intraoral examination. Of importance are discrepancies in arch length, abnormal tooth inclinations, functional patterns as evidenced by worn areas on occluding surfaces, evidences of pressure habits and the nature of alveolar bone as evaluated from x-ray and intraoral examination.

Cephalometrics supplies detailed information to supplement and verify observations already made. While it is possible to record many measurements, the most significant ones are those recording the relation of the mandible to the maxilla, the relation of the anterior teeth to each other and to their respective bases, and the angle of the mandibular plane. The interpretations made from cephalometric measurements should make diagnostic sense and should convey a consistent relation to observations made from other diagnostic criteria.

Dr. Harold Noyes has aptly described his reaction to the teaching of case analysis as follows, "Case analysis techniques fall into the training class. Because of the time element, graduate instruction has some advantage in presenting various methods, but it holds no corner on this market. There has been too great a tendency to reduce case analysis to formulas, which in some measure may be necessary when teaching students without experience. Yet with respect to analysis of the cephalometric x-ray, this has proceeded to the point where the immature orthodontist often cannot see the structure for the planes and angles. There is created a slide rule diagnostician and some years of experience may transpire before judgment replaces rule of thumb. I have been amused when listening to recent graduates discuss their problems, to hear one say that the angle is thus and such so we extract four premolars. In reality I am not too critical of this didacticism because it has been a crutch upon which the young orthodontist can lean before his clinical judgment will support him."

In some respects, with their educational background in the fundamentals

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of growth and development, and their slide rule interpretations, the present orthodontic graduates are much better equipped than those who were graduated a few years ago. Clinical judgment is an intangible sort of entity which I suspect most of us think we develop after years of experience. It undoubtedly seems to be more reliable to us when growth responses are such that they complement what we have tried to do orthodontically.

Rigid treatment standards help to produce more uniform results. However variations in the distribution of growth and the time at which such growth takes place frequently make the attainment of such goals most difficult. The strong tendency for structural relations and muscle forces to dictate the ultimate position of the denture and the axial inclinations of the teeth may be an adequate reason for not attempting to treat to a rigid concept of an ideal pattern.

An examination of the records of the following four treated cases will demonstrate the role played by variation. Tooth movements have varied greatly even though subjected to similar forces. Extreme discrepancy in the bone relations has invited what may be considered unfavorable incisor inclinations. Posttreatment growth has changed the positions to which teeth were moved in treatment. Growth that was not anticipated has had both favorable and unfavorable effects upon tooth relations and facial esthetics.

Treated Cases

Case R.S. was a boy thirteen years of age with a Class II, Division 1 malocclusion. The Downs analysis indicated a convex type of face with a tendency for a backward divergency of the mandibular area. There was a moderately good relation of mandibular teeth to structure. While this case was evaluated as being one in which it might be necessary to remove some teeth, an attempt was made to treat it without any extractions.

Edgewise appliances were used in treatment and the arch relation was changed by the use of intermaxillary elastics worn day and night for three and one-half months. Active appliances were worn for thirteen months.

An evaluation of the posttreatment records indicated a good growth response and a favorable change in structural relations. There was a 5 degree labial tipping of the mandibular incisors considered to be unfavorable. The maxillary incisor relation to the AP plane was changed from 13 to 7 millimeters. An original FMIA of 55 degrees was changed to 51 and the tissues of the lips were strained in closed position. The prognosis was considered definitely unfavorable. The unpredictability of future growth and a reluctance on the part of the patient to have the case retreated were factors which influenced me to leave the case without further treatment. The condition was retained for three years.

Additional impressions for models and photographs were taken at seventeen years of age, also cephalometric records were taken at sixteen and seventeen years of age. These later records show that very extensive growth occurred in the entire face with a swinging forward of the mandible as a result of growth. There were significant improvements in the facial plane, angle of convexity, AB plane, mandibular plane, and Y axis. The maxillary incisors which had been moved to 7 millimeters to the AP plane remained in this position. The occlusal plane was tipped during treatment from 11 to 12 degrees and went back to 10 degrees in the posttreatment period. While the mandibular incisors were tipped labially from 6 to 11 de-

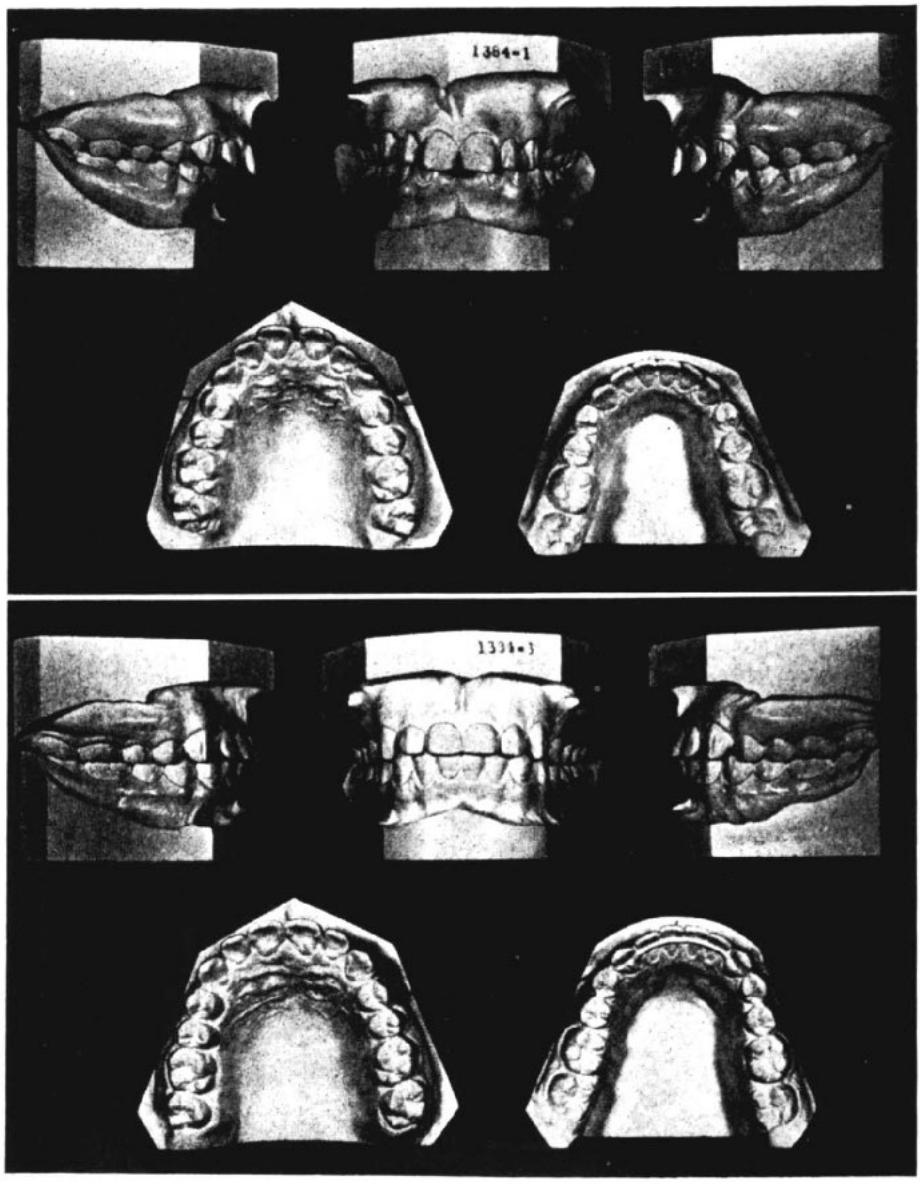

Fig. 1 Models of R. S. before, and three years after treatment.

Fig. 2 Photographs of R. S. before, after, and three years after treatment.

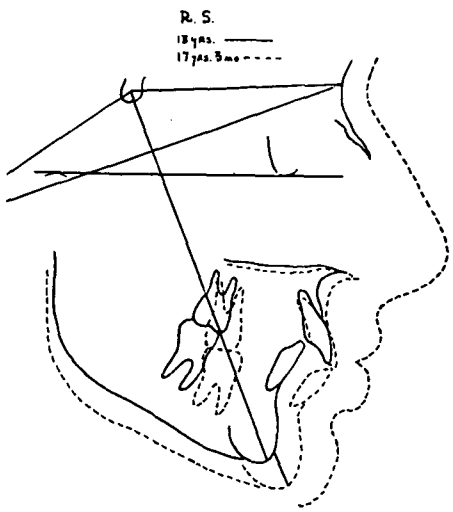

Fig. 3 Composite tracings from Downs analysis of R. S.

TABLE I

R. S.	13 years	14 years 4 months	17 years 3 months
Facial Pl.	80	82	84
Convexity	8	4	5
A-B Plane	—11	—7	—9
Mandibular Pl.	28	28	24
Y Axis	69	67	67
Occlusal Pl.	11	12	10
Interincisal	123	120	108
$\overline{1}$ to Occ. Pl.	23	27	36
$\overline{1}$ to Mand. Pl.	6	11	22
$\underline{1}$ to A-P Pl. (mm)	13	7	7
FMIA	55	51	44

grees during treatment, during the posttreatment period they continued to tip to a final reading of 22 degrees. Corresponding changes are observed in their relation to the occlusal plane, their effect on the interincisal angle and the FMIA which changed from 55 to 44 degrees.

The face which had strained tissues about the denture at the conclusion of treatment now has relaxed tissues in a good state of balance. The profile exhibits a convex type of face with sharp prominent features and tissues in good esthetic and functional balance.

The teeth have moved and have been worn into a good functioning relation. It has been recommended that impacted mandibular third molars be extracted and that when the maxillary third molars erupt they also be extracted.

Growth and adjustment are responsible for whatever may be favorable about this case. It appears obvious that when natural forces were permitted to work on the denture, they produced a much greater procumbency of mandibular incisors than was produced by treatment.

Case C.P. was a girl thirteen years and nine months of age. The occlusion was an atypical, unilateral distocclusion with crowding in the incisor area of both arches and a deep anterior overbite. The teeth were in good relation to basal structures. The FMIA was 52 degrees indicating a procumbency of the mandibular incisors. The mandibular third molars were present and in good position but maxillary third molars were not discernible. The face was most pleasing with a straight profile.

Since the girl was almost fourteen years of age, it was considered a reasonable assumption that future growth would be minor in degree. Because it was considered a borderline case in which extraction could be considered debatable, the maxillary first bicuspids and the mandibular second bicuspids were extracted.

In treatment an effort was made to move posterior teeth forward and avoid lingual tipping of the anterior teeth. Active treatment was completed in eighteen months.

The facial plane changed from 78 to 82 degrees. There was a great change

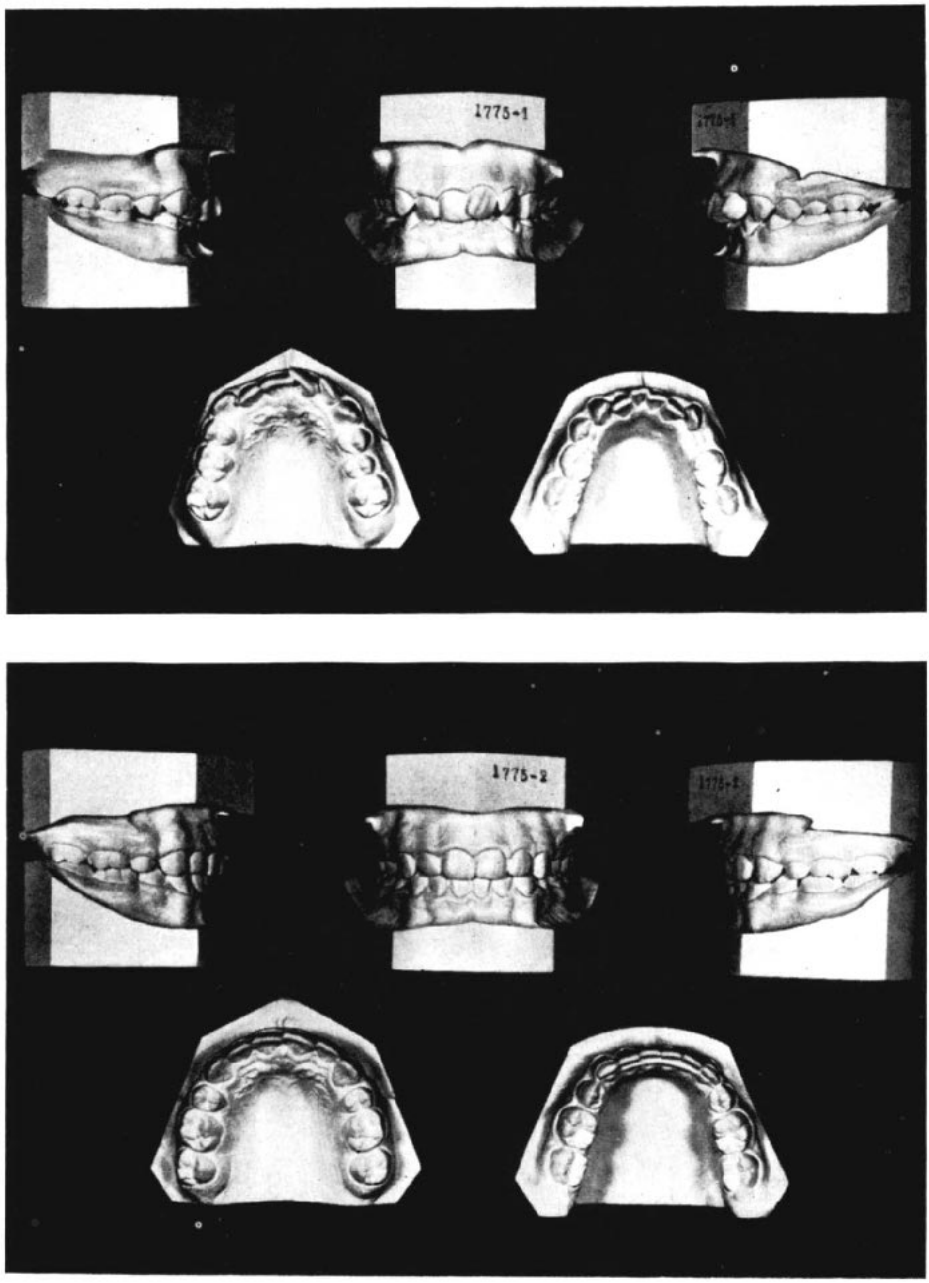

Fig. 4 Models of C. P. before and after treatment.

Fig. 5 Photographs of C. P. before and after treatment.

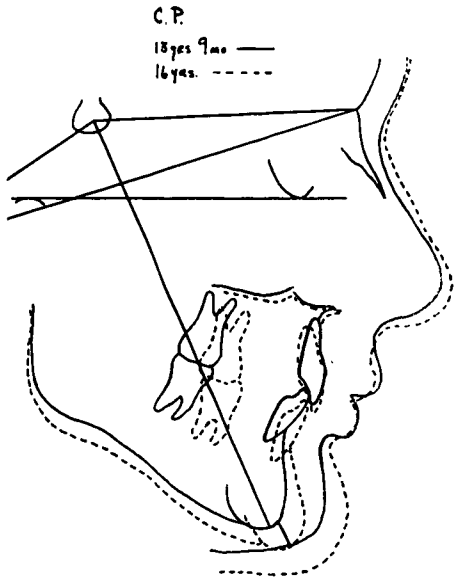

Fig. 6 Composite tracings from Downs analysis of C. P.

TABLE II

C. P.	13 years 9 months	16 years
Facial Pl.	78	82
Convexity	0	—5
A-B Plane	—7	—7
Mand. Pl.	32	30
Y Axis	67	65
Occlusal Pl.	17	15
Interincisal	143	144
$\overline{1}$ to Occ. Pl.	21	15
$\overline{1}$ to Mand. Pl.	6	0
$\underline{1}$ to A-P Plane	3	0
FMIA	52	59

in the angle of convexity from 0 to —5 degrees. There were also similar changes in the mandibular plane and Y axis which would indicate a forward position of pogonion.

The maxillary incisors were tipped slightly to the labial and their relation to the AP plane changed from 3 to 0 millimeters. The mandibular incisors were tipped lingually from 6 to 0 degrees to the mandibular plane. The combination of incisor movement left the interincisal angle one degree from the original. The FMIA changed from 52 to 59 degrees. If one were to attempt to make these teeth conform to Tweed standards, they would require lingual tipping of 6 more degrees. This being a straight face, the 65 degree FMIA should be applicable, at least more so than in a convex type of face.

The photographs taken at the conclusion of treatment showed disappointing results. The lovely, straight profile and excellent balance in the original have changed to essentially a concave profile in spite of all the precaution taken in treatment to avoid such a result.

A study of the composite tracing will show in some degree why this happened. While the lip area remained in essentially the same position, there has been considerable growth of the nose and mandible. Some growth has occurred at gonion and there is a great amount of appositional growth at pogonion.

Looking at this case in retrospect, it seems as though it would have been better to have treated it without extraction, even though some crowding were to occur in the incisor area following treatment. Without extraction there probably would be a tendency for the same change in esthetics, although less in degree. Unusual cases like this one make it difficult to predict the nature of growth or to make treatment results conform to average measurements.

Case C.R. was a girl nine and one-half years of age. She had a Class II, Division 1 malocclusion with an extreme discrepancy in the incisor area and a marked AB difference. There was crowding of teeth in both arches.

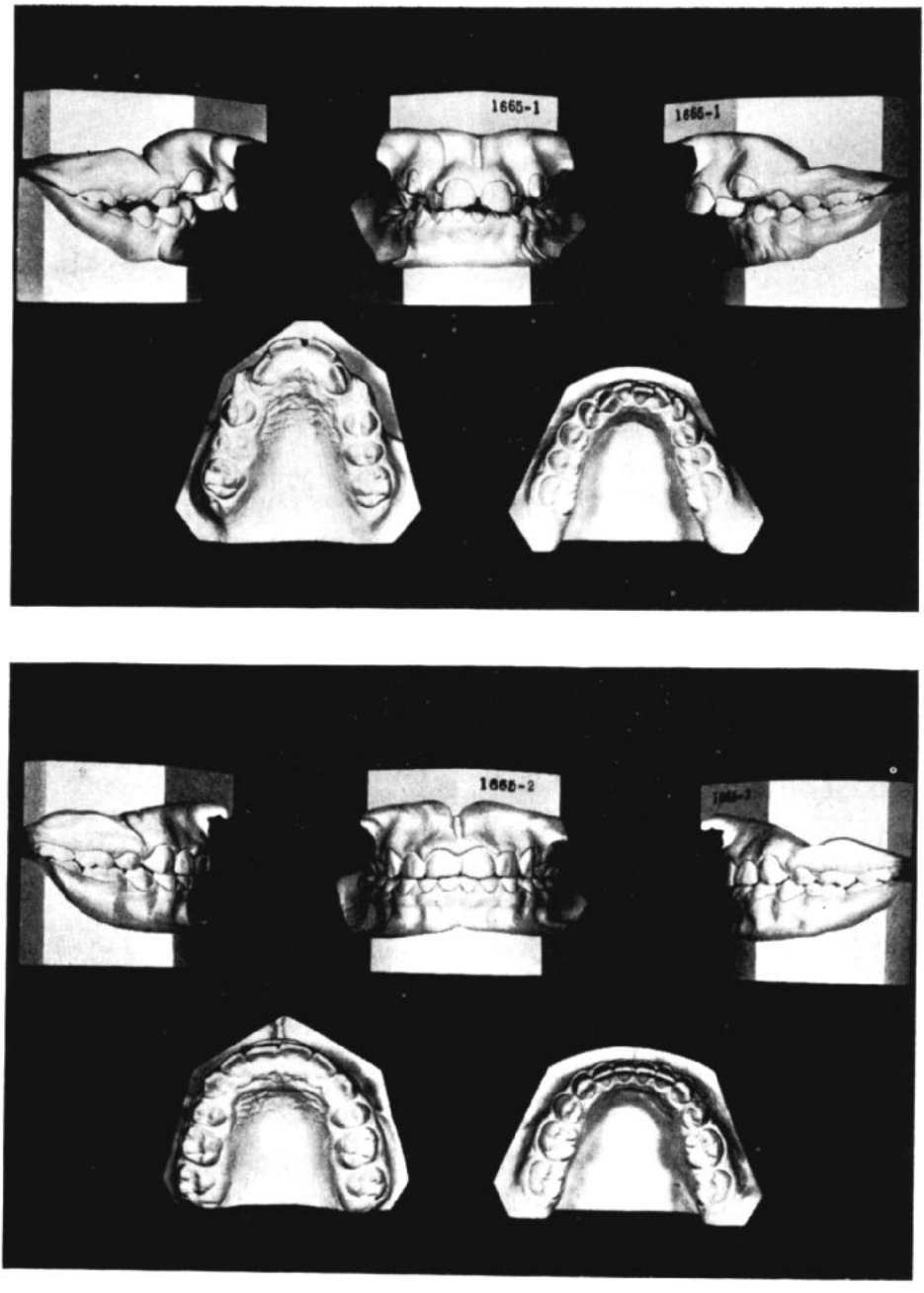

Fig. 7 Models of C. R. before and after treatment.

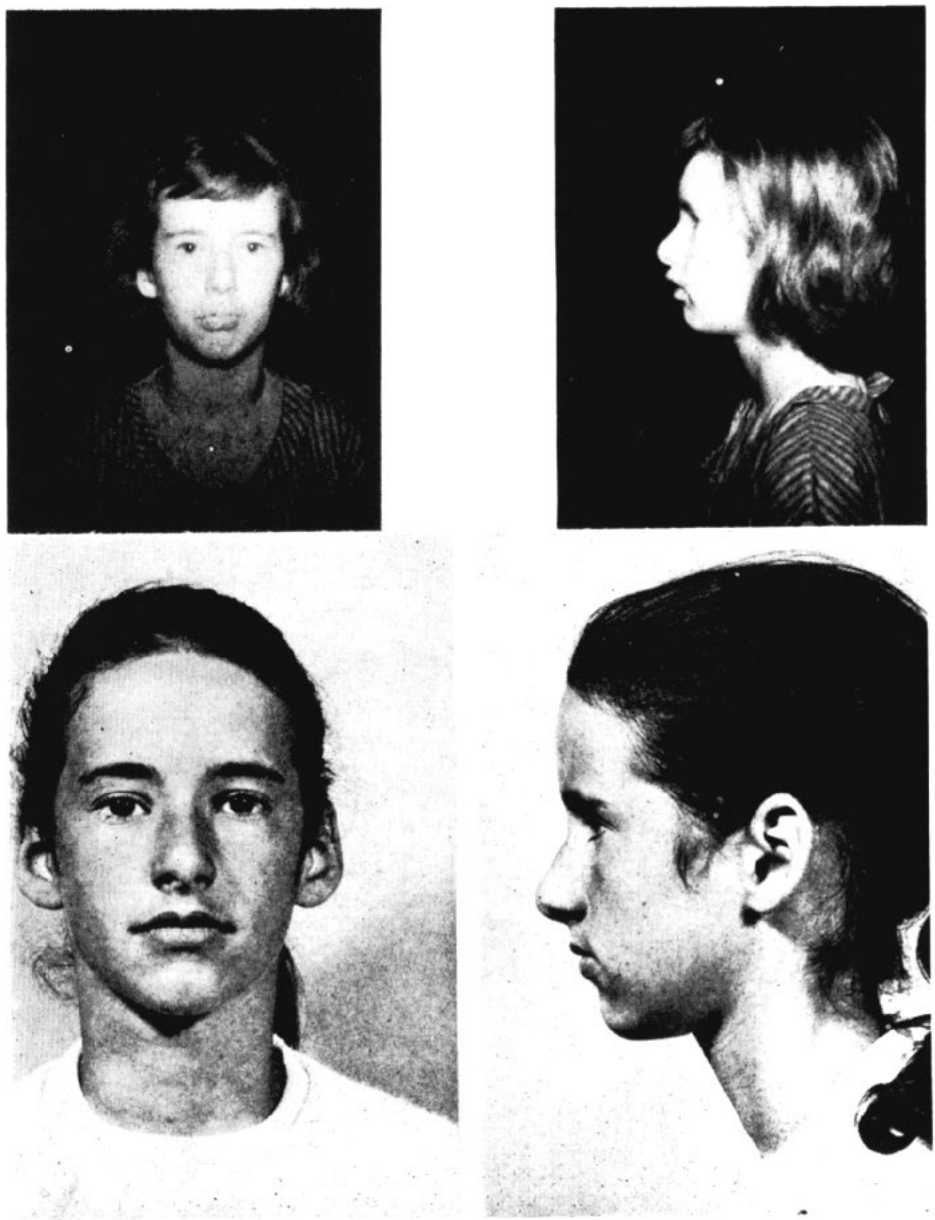

Fig. 8 Photographs of C. R. before and after treatment.

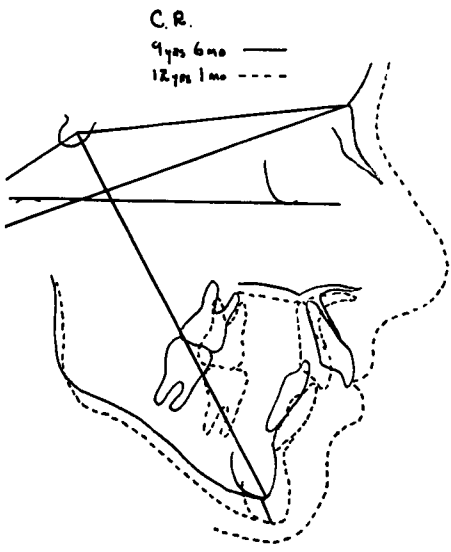

Fig. 9 Composite tracings from Downs analysis of C. R.

TABLE III

C. R.	9 years 6 months	12 years 1 month
Facial Pl.	80	81
Convexity	5	0
A-B Pl.	—7	—6
Mand. Pl.	31	33
Y Axis	61	62
Occlusal Pl.	9	11
Interincisal	125	130
$\overline{1}$ to Occ. Pl.	21	22
$\overline{1}$ to Mand. Pl.	—3	1
$\underline{1}$ to A-P Pl. (mm)	13	5
FMIA	61	56

She had a 5 degree angle of convexity, a —7 degree AB plane, and an interincisal angle of 125 degrees. The maxillary incisors were 13 millimeters to the AP plane and the FMIA was 61 degrees.

She had been a persistent thumb sucker which contributed to the degree of malocclusion and disturbance in facial features.

In spite of the fact that the permanent dentition was completed and she was ready for treatment at such an early age, it did not seem conceivable that future growth could accommodate the degree of movement that would be required to occlude such a case. The maxillary first bicuspids and mandibular second bicuspids were extracted.

Spaces were closed in the mandibular arch first. When ideal arch alignment was completed, this arch was used as an anchorage unit, and intermaxillary elastics were employed with closing loops to retract the maxillary anteriors. Active treatment was completed in twenty-three months.

The changes in the cephalometric readings for the most part were favorable. The angle of convexity changed from 5 to 0 degrees, and the AB plane from —7 to —6 degrees. The change in the interincisal angle was due mostly to the labial tipping of the mandibular incisors. The maxillary incisors maintained their original inclination and have changed from 13 to 5 millimeters in relation to the AP plane.

There has been a reasonable amount of facial growth during the two year treatment period. Appositional growth was quite pronounced at pogonion.

While the mechanics used in treating were the same as those employed in similar cases which have exhibited less ideal tooth movements, it is interesting to evaluate why this happens. Longer treatment time and an excellent growth response seem to be the most likely factors responsible for the change.

A current method of demonstrating orthodontic changes has been to relate such movements to the front of the face by transferring the original Frankfort and NP planes to the posttreatment tracing. This has been done for this case in Figure 10. This gives the impression that the maxillary incisors and point A have been moved lingually to an

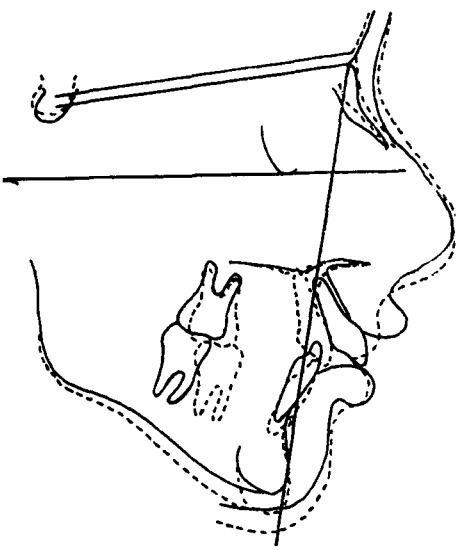

Fig. 10 Composite tracing of C. R. registered on the original Frankfort and NP plane.

extreme degree. The superimposition made on the contour of the maxilla in Figure 11 gives a more accurate indication of tooth movement than superimposing on the original NP as in Figure 10.

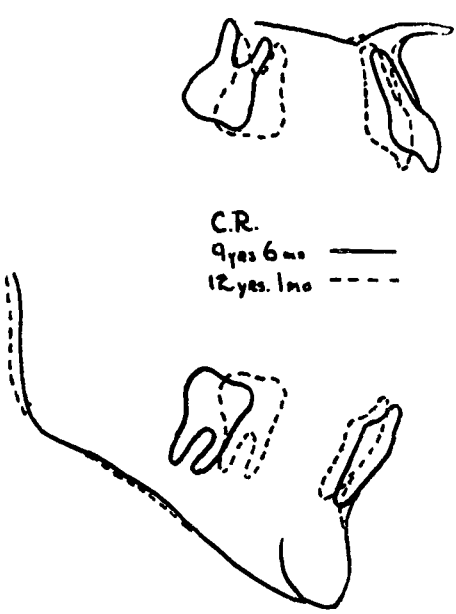

Fig. 11 Maxillary and mandibular composite tracings of C. R.

If, as some have recommended, the mandible is superimposed on pogonion as in Figure 11, it indicates a lingual movement of the mandibular incisors and alveolar process. This is an erroneous impression caused by the growth which has taken place at pogonion.

Case R.B. was a boy ten years of age with a Class II, Division 1 malocclusion. There was an extreme discrepancy in the incisor area with crowding of the mandibular incisors. The Downs analysis indicated structural relations approximating the mean except for the slightly high mandibular plane of 28 degrees. The interincisal angle was 123 degrees and the maxillary incisors were 9 millimeters to the AP plane. The denture was very prominent in the face which made it difficult to close the lips.

He was still sucking the thumb some at the beginning of treatment.

There was no hesitation in recommending the extraction of the maxillary first biscuspids and the mandibular second bicuspids. Treatment was carried out for this case the same as for the preceding one. The mandibular arch was closed first and used as anchorage for retracting the maxillary anterior teeth with intermaxillary elastics. Active treatment was completed in seventeen months.

While the changes in structural relations were not extreme, they were all adverse. The angle of convexity, the AB plane, the mandibular plane, the Y axis, and occlusal plane all changed unfavorably. There was practically no mandibular growth. While the maxillary incisors were changed from 9 to 0 millimeters to the AP plane, this was mostly a tipping movement. As unfavorable as it may be to have the mandibular incisors tip 5 degrees to the

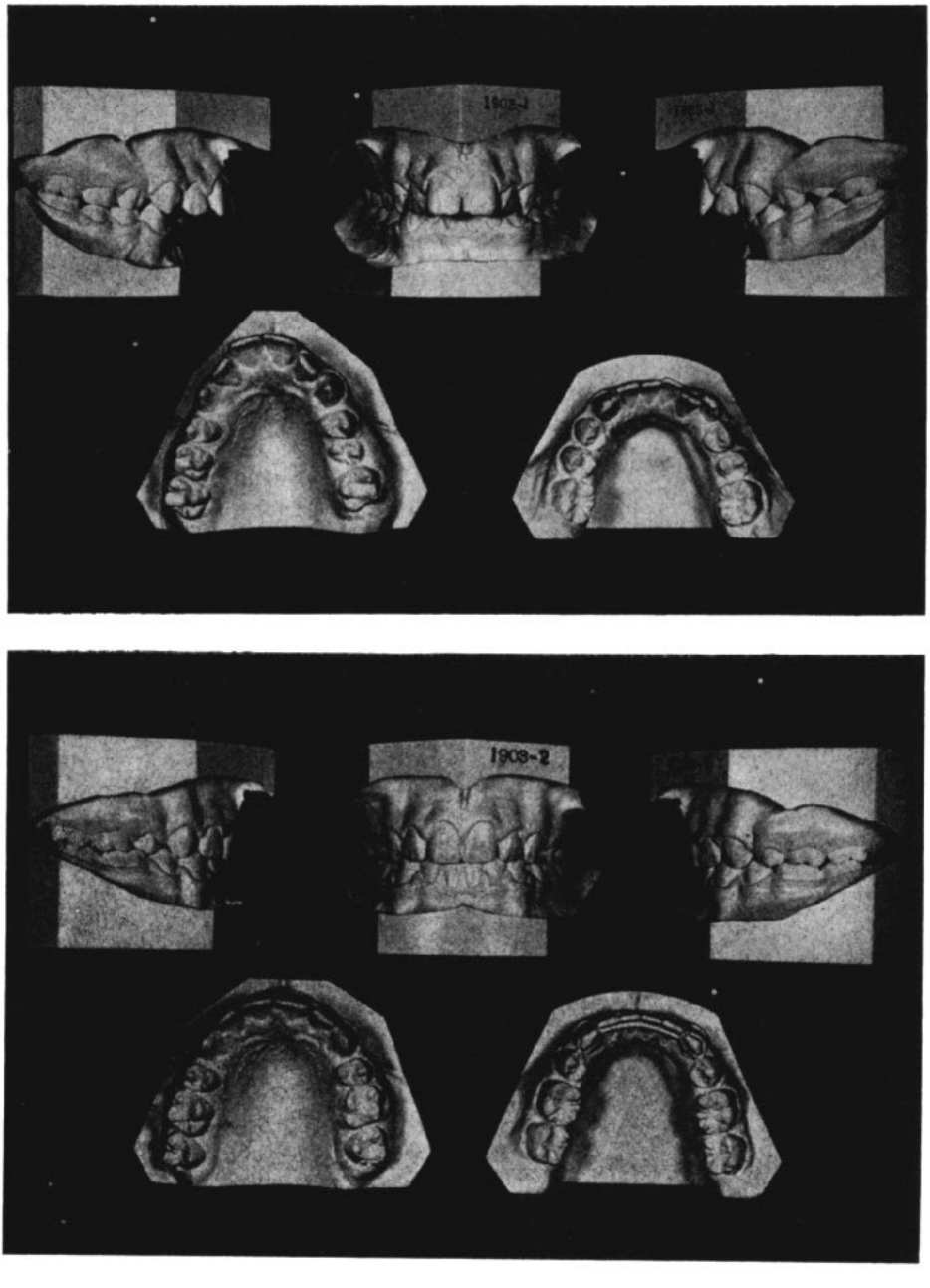

Fig. 12 Models of R. B. before and after treatment.

Fig. 13 Photographs of R. B. before and after treatment.

labial, if this had not occurred, the maxillary incisor position would have been worse, unless by extreme mechanics it would have been possible to get more bodily movement.

The appearance of the face improved considerably. The change in incisor position alone could be responsible for this. The patient was still below twelve years of age when treatment was completed and it is to be hoped that future growth may improve the relations which now exist.

It is logical to ask why this case responded so differently from the preceding one. Failure to use mechanics in the same way could be partly responsible. I believe, however, that the nature of growth has influenced the effect of appliance therapy to a large degree.

Dental relations are not static. Class I occlusions, whether treated or untreated, undoubtedly remain much more constant in their relation to the face and in axial tooth positions than do the other classes. Exaggerated tooth movements attempted in cases with bone and soft tissue discrepancy are difficult to obtain. They may result in damage to bone and root tissue and there is frequently a tendency for teeth to revert to their original position and axial alignment.

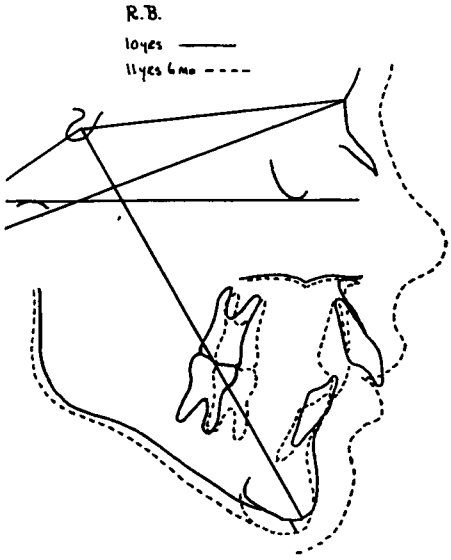

Fig. 14 Composite tracings from Downs analysis of R. B.

As discouraging as this may sound, it is not all so futile. Failure to obtain what is considered to be ideal tooth inclinations in treatment may be compensated for by posttreatment growth of the face and subsequent favorable dental adjustments. It is important to have patient cooperation during this period so that, if indicated, further guidance and retention of the denture may permit the forces of growth and function to act as favorably as possible.

The basis for establishing normal standards has been to use the measurements found in the esthetically pleasing, slightly convex type of face. The face which Tweed has used has a slight mental prominence and a denture which would be considered by many to be slightly recessive.

One can not argue to any degree about the esthetics of such a face, nor about the stability of the denture. I am sure we would be very happy if we

TABLE IV

R. B.	10 years	11 years 6 months
Facial Pl.	86	85
Convexity	3	6
A-B Pl.	—5	—9
Mand. Pl.	28	32
Y Axis	60	62
Occlusal Pl.	8	16
Interincisal	123	146
$\overline{1}$ to Occ. Pl.	23	20
$\overline{1}$ to Mand. Pl.	1	6
$\underline{1}$ to A-P Pl. (mm)	9	0
FMIA	60	53

could find such facial and dental relations requiring even some degree of treatment. However, a large percentage of cases that ask for treatment have varying degrees of bone discrepancy and inadequacy, coupled with tongue and labial and buccal musculature imbalance. A serious attempt to make all such relations conform to this assumed beautiful ideal standard is bound to result in injuries to bone and root structure, and in future disappointment resulting from instability.

Much time has been spent in examining the normal and the ideal both in untreated and treated cases. A vision of the ideal gives us a sense of direction and a goal toward which we aim in treatment. The beautiful stable result gives us encouragement and an opportunity to bolster any personal ego we may have. However, now that we recognize the ideal and are familiar with the measurements of such a face, I think we could benefit by spending some time re-examining the relations in faces which are not so ideal.

The records which I have examined indicate a strong tendency for incisor axial inclinations to vary according to the mesial distal relation of the maxilla to the mandible. The following four untreated adult cases have functionally good occlusions, but exhibit a wide range of variability, as do the faces.

The superimposition of lateral cephalometric tracings provides a graphic way of demonstrating the variations in the facial patterns and the way in which the denture in each case fits the pattern. It is my impression that all too frequently when we treat such tooth to bone relations and attempt to make the angles conform rigidly to our concept of the ideal, we ignore tooth to bone and soft tissue relations that have been stable and to which teeth will return if they have been disturbed excessively.

Case J.I. is thirty-two years of age with an excellent dental occlusion, good esthetics and structural relations. The measurements conform to the Downs normal range. The maxilla is posterior in its relation to the mandible with the resulting —9 degree angle of convexity and 1 degree AB plane. A 24 degree mandibular plane angle is associated with the mandibular incisors at 85 degrees to the mandibular plane and an FMIA of 71 degrees. This is a striking example of lingually-inclined mandi-

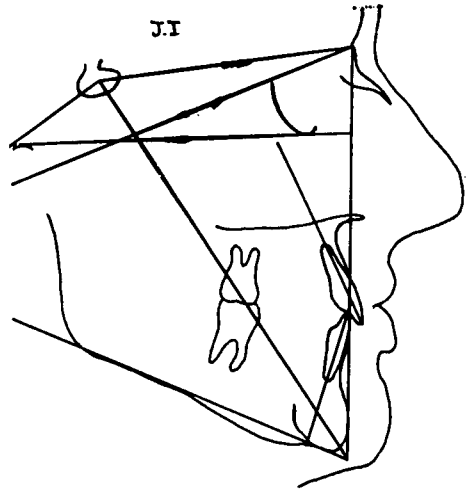

Fig. 15 Tracing from Downs analysis of J. I.

TABLE V

J. I.	
Facial Pl.	88
Convexity	19
A-B Pl.	1
Mand. Pl.	24
Y Axis	58
Occlusal Pl.	11
Interincisal	139
$\overline{1}$ to Occ. Pl.	8
$\overline{1}$ to Mand. Pl.	—5
$\underline{1}$ to A-P Pl. (mm)	5
FMIA	71

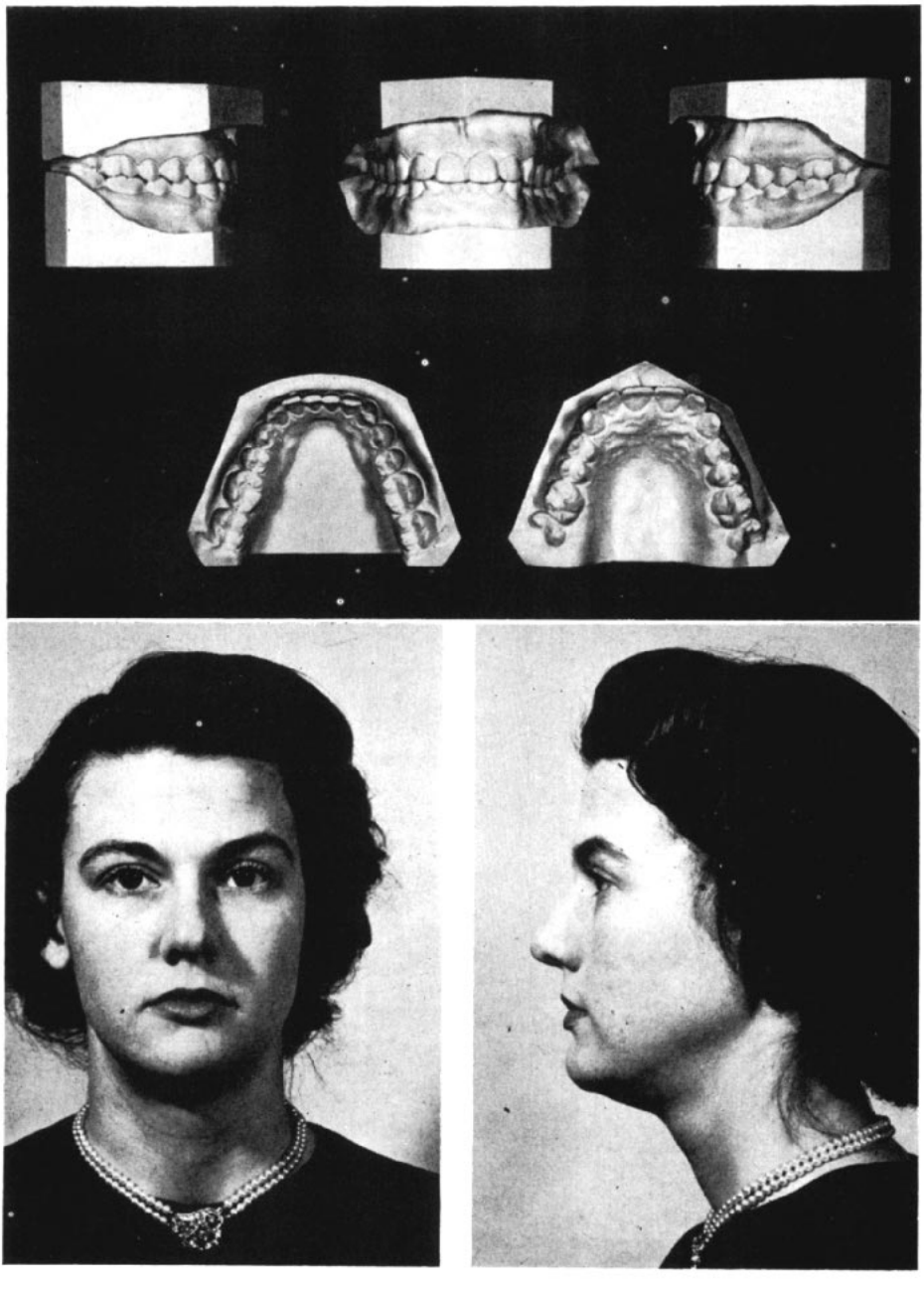

Fig. 16 Models and photographs of J. I.

bular incisors fitting harmoniously into a pattern of a posteriorly located maxilla.

The Frankfort plane has been considered to be reasonably normal in its location with an angle of 6 degrees to the SN plane. It will be used as a standard for comparing some of the succeeding cases.

Certainly no one would ever be criticized if they treated to the measurements which exist in this case. If the orthodontist was not most sensitive to the structural relations, he would probably leave the mandibular incisors tipped more to the labial, whether done intentionally, or by lack of care in archwire adjustment. Such movements could be traumatizing and also require additional posttreatment adjustment by natural forces.

Case B.D. is twenty-six years of age with a functionally good occlusion. There have been no third molars.

There is a 14 degree angle of convexity, —8 degree AB plane, 33 degree mandibular plane and FMIA of 52 degrees. The Bolton triangle is almost

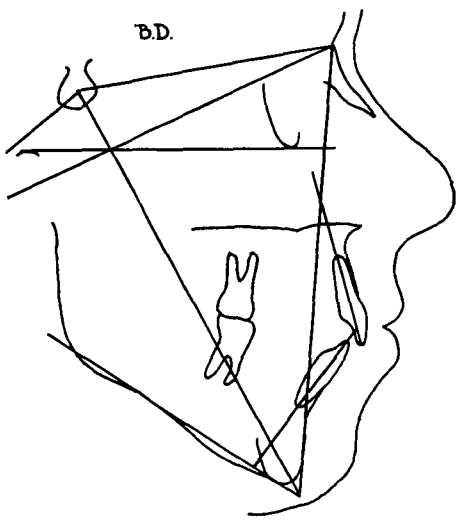

Fig. 17 Tracing from Downs analysis of B. D.

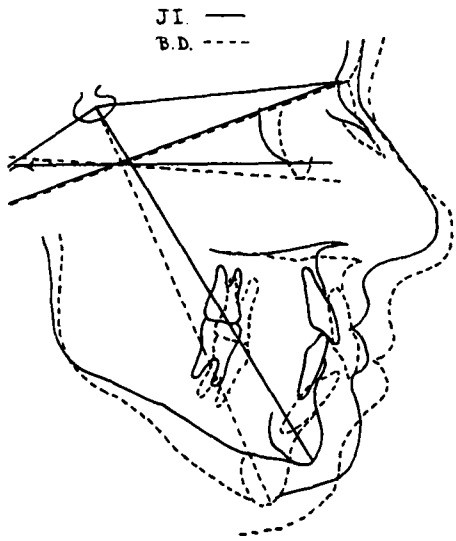

Fig. 18 Composite tracing of B. D. and J. I.

the same size as in J.I. The anterior end of the Frankfort plane is 5 degrees lower than in J.I., which causes measurements to Frankfort to be 5 degrees more favorable than they should be for conveying the same impression of relations as in J.I.

A composite of the lateral tracings of these two cases superimposed on the Bolton triangles shows the second case farther forward at nasion, maxilla, the

TABLE VI

B. D.	
Facial Pl.	85
Convexity	14
A-B Pl.	—8
Mand. Pl.	33
Y Axis	62
Occlusal Pl.	12
Interincisal	129
$\overline{1}$ to Occ. Pl.	25
$\overline{1}$ to Mand. Pl.	5
1 to A-P Pl. (mm)	10
FMIA	52

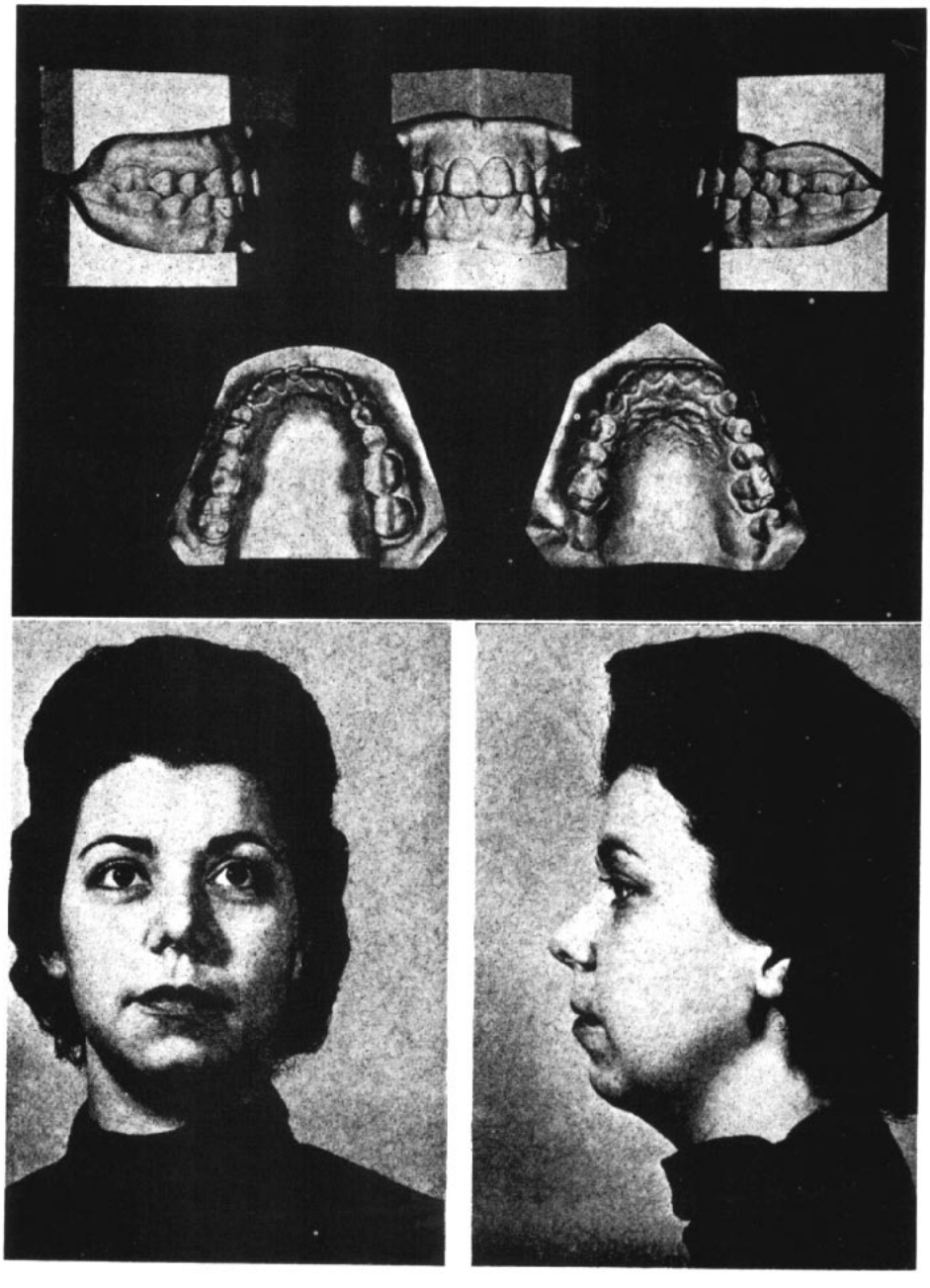

Fig. 19 Models and photographs of B. D.

nose and lips, with a posterior position of pogonion and a steep mandibular plane. There is a conspicuous tendency for the teeth in each case to fit the structures of the face.

This patient is not at all concerned about the relations of her denture and, if she were, it would not be wise to attempt changing it with the possibility of damage to the health and function which exist.

If malocclusion were present in such a structural relation, I believe it would be unwise in treatment to place the incisors in an exaggerated lingually-inclined position since they would not fit the components which exist in the remainder of the facial complex.

The positioning of the mandibular incisors lingually would require lingual movement of the maxillary incisors with very extensive lingual root movement. While it is possible to do this, the logic of such movement is debatable. The denture is already in good alignment with good tissues and function. Lingual positioning of the teeth and resulting change of contour of the lips may help

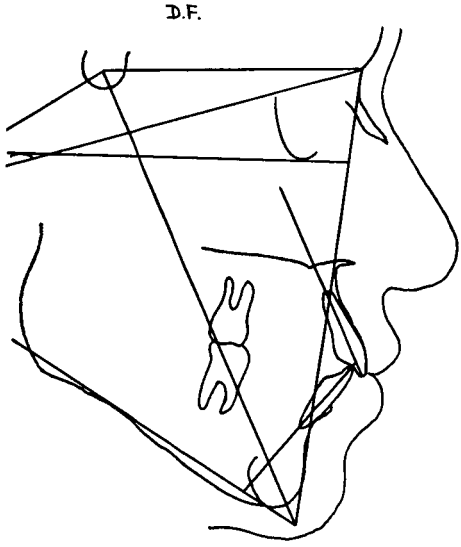

Fig. 20 Tracing from Downs analysis of D. F.

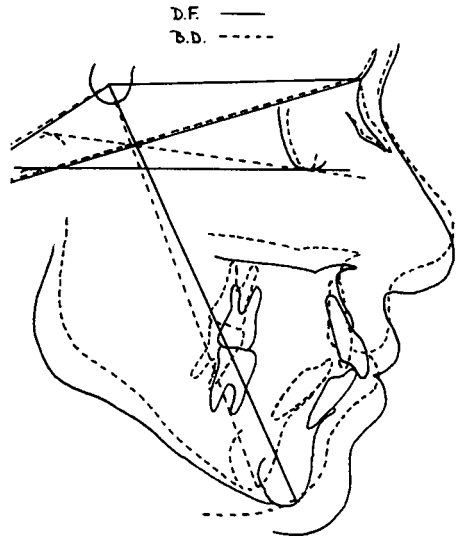

Fig. 21 Composite tracing of B. D. and D. F.

the contour of the tissues of the chin, but will exaggerate the contour of the nose. In all probability the effect of pattern and muscle balance in the posttreatment period would cause the teeth to approach their original relations.

Case D.F. is forty-three years of age with a functionally good occlusion. While the denture appears protrusive with a procumbency of both maxillary

TABLE VII

D. F.	
Facial Pl.	84
Convexity	1
A-B Pl.	—1
Mand. Pl.	31
Y Axis	65
Occlusal Pl.	11
Interincisal	117
$\overline{1}$ to Occ. Pl.	28
$\overline{1}$ to Mand. Pl.	6
$\underline{1}$ to A-P Pl. (mm)	12
FMIA	52

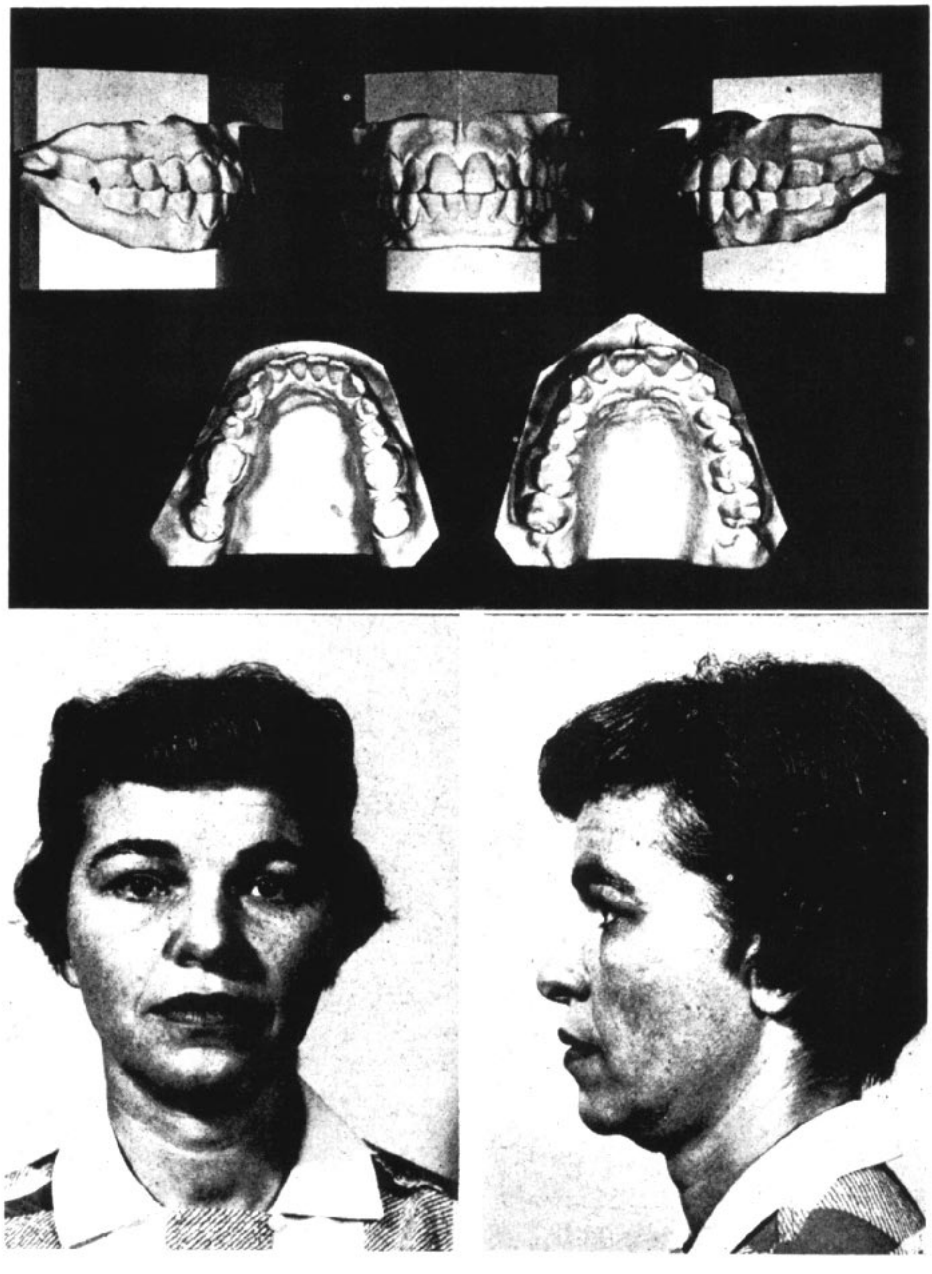

Fig. 22 Models and photographs of D. F.

and mandibular incisors, the muscles of the face are relaxed and function well.

The facial balance and tissue relations are better in this case than in the previous one, B.D. The increased procumbency of the maxillary incisors would seem to be an adjustment to the more anteriorly placed mandible and straight face with a one degree angle of convexity.

The 8 degree difference in the relation of the Frankfort planes of the two cases may appear to be a part of a total pattern, but should be considered in interp.eting angles related to Frankfort. D.F., with the straight face and anteriorly located pogonion, actually has the less favorable 65 degree Y axis reading. While they both have a 52 degree FMIA, their mandibular incisors are not located the same in the face.

The superimposition of the tracings of these two cases provides a good illustration of the adaptation of the denture to the structures of the face. The maxillary incisors in particular are inclined forward in the straight type of face having good mandibular development. They are inclined lingually in the face with the recessive mandible and the steep mandibular plane.

If the axial inclinations of the incisors fit the structures of the face with any degree of balance as they seem to in these two cases, then orthodontic treatment which changes these angular relations also disturbs balance and function.

Case S.G. is forty-seven years of age. Although she has had some posterior teeth extracted, the occlusion of the rest of the teeth and the incisor position is very acceptable. The face with its —3 degree angle of convexity is pleasing in its appearance.

The facial dimensions are similar in size to the first case, J. I., which had

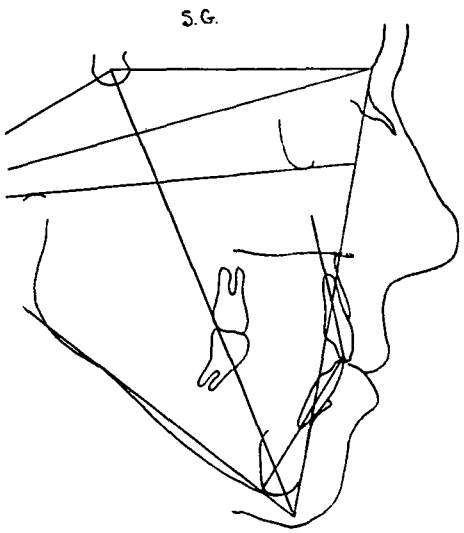

Fig. 23 Tracings from Downs analysis of S. G.

TABLE VIII

S. G.	
Facial Pl.	74
Convexity	—3
A-B Pl.	1
Mand. Pl.	43
Y Axis	74
Occlusal Pl.	22
Interincisal	134
$\overline{1}$ to Occ. Pl.	17
$\overline{1}$ to Mand. Pl.	—5
$\underline{1}$ to A-P. Pl.	8
FMIA	52

very ideal tooth and bone relations and supposedly a normally located Frankfort. A superimposition of her tracing on that of J.I. shows a face longer in vertical dimension with a steeper mandibular plane, and a more retrusive position of pogonion. The change in mandibular incisor position fits her pattern very well. Porion, being located very low in the face, causes a 10 degree difference in the angle of Frankfort. This is responsible for the ex-

Fig. 24 Models and photographs of S. G.

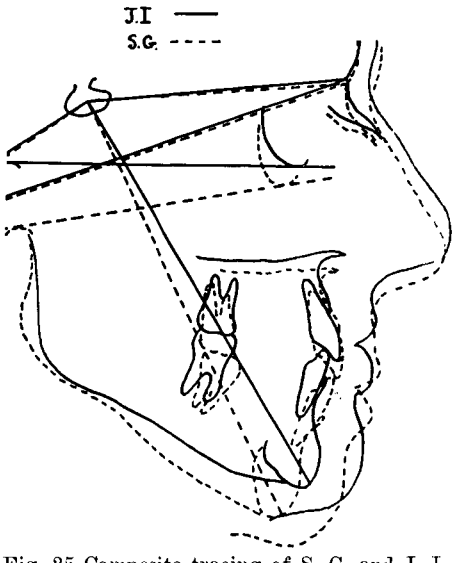

Fig. 25 Composite tracing of S. G. and J. I.

treme discrepancy in all the measurements related to Frankfort. Of particular interest is the FMIA of 52 degrees in a face with quite acceptable facial and denture relations.

This patient has never considered that she had any need for orthodontic treatment and of course has never had any. This is no doubt fortunate for her sake. With the Frankfort plane so situated, had there been some excuse for treatment, a present day philosophy would indicate the necessity for establishing an FMIA of 65 degrees which no doubt would be highly damaging to tissues and also unstable.

The mandibular incisors, according to some present day standards, are too far forward in relation to bone structure. Certainly many would criticize their position if they had been so treated. However, this case, even with the posterior extractions, has had many years of good function and healthy tissues. It would be my guess that many treated cases at forty-seven years of age will never have as good function or as healthy tissues as are present in this case.

Discussion

1. The results of orthodontic therapy are more favorable when they are complemented by growth processes.
2. The variations of growth in the cases which were treated indicate that appliance therapy has only a small effect upon growth tendencies.
3. Tooth positions and inclinations are affected quite extensively by the distribution and amount of growth. Cephalometric records taken at frequent intervals may be used to determine when it is necessary to alter the mechanics to resist unfavorable effects of growth.
4. Serial evaluations of tooth movements during treatment should differentiate the changes instituted by therapy from those that are the result of growth.
5. Variations in the position of Frankfort make it unreliable as a plane to which other structures can be related except in serial studies.
6. Infinite variations in face and tooth relations make rigid standardizations in orthodontic goals inconceivable. Beauty and harmony are the product of all the structures of the face. Since the denture area is the only part readily alterable, any changes made there must complement as much as possible the other components of the face.
7. Variations in structural relations make it difficult to consistently move teeth to preconceived positions of normalcy. The forces dictated by growth, structural relations and muscle function will ultimately alter the results in the postretention period. This is consistent with the adjustment of

tooth position according to structural relation observed in the untreated adult cases.

BIBLIOGRAPHY

1. Noyes, H. J.: The Education of An Orthodontist, *Am. J. Ortho.* 44: 648, 1958.
2. Tweed, Chas. H.: The Frankfort Mandibular Incisor Angle (FMIA) In Orthodontic Diagnosis, Treatment Planning and Prognosis, *Angle Ortho.* 24: 121, July, 1954.
3. Lindquist, John T.: The Lower Incisor—Its Influence on Treatment and Esthetics, *Am. J. Ortho.* 44: 112, 1958.

DISCUSSION

Dr. C. F. Wright

We are indebted to Dr. Buchner for a very fine and timely paper and I am happy to have this opportunity to discuss it for he has mentioned some points which I have been discussing with some of you for a long time; this gives me an opportunity to discuss these factors with all of you.

I can agree that the present day orthodontist is better equipped to render a better diagnosis and a better service than ever before and, in general, I think that he is doing just that. When I compare my own results and yours with results of thirty years ago, there can be no doubt about it.

However, unlike Dr. Buchner who is amused at the slide rule diagnostician, I am concerned about him, and the influence he is having upon the thinking of the profession. I am concerned because such diagnostic methods are contemptuous of the biologic aspects of the problem. The slide rule diagnosis tells us nothing of the biologic processes involved in the development of normal occlusion, nothing of the teeth themselves, their supporting structures or of their function. Perhaps, most important of all, it makes no allowances for time. The slide rule diagnosis, like the diagnosis made from a set of occluded plaster models, can be very misleading and can create problems where no problems exist for both represent but an instant of time.

I think the essayist demonstrated this point very clearly. In the first case shown the results were functionally and esthetically acceptable for this individual, yet some of the slide rule readings are far outside of the accepted cephalometric standards and the results are worse by those standards than they were originally. The point here is that the natural biologic and functional forces working with time ignored any preconceived standards.

The second case is an excellent example of how a static model or slide rule diagnosis can betray one. I should like to emphasize how one must project what we have learned about growth and development and the working of time into analysis and treatment planning. I think we would all agree that this individual has a beautifully proportioned face, one that belies the malocclusion present, and one we do not wish to change except to keep it progressing forward with the downward and forward growth changes of basal structures that we expect to occur. From the models we discover that on the left side there is a perfectly normal relationship of teeth to each other in the same arch and equally good relations of the teeth of one arch to those in the opposing arch and all in fine relation to their respective jaws. Turning now to the right side, there is the same good relationship of teeth to each other in the same arch but a Class II relation of the arches as indicated by the teeth in this occluded model. This latter relationship could be misleading. There could be present a right mandibular deflection arising from the retruded maxillary incisors. We can be quite certain of this for both arches are

symmetrical, yet there is an inharmony of the midlines to the extent of a complete tooth. Often, a functional analysis will verify this, but not always, for the muscles may have been conditioned to this deflection. In treatment the occlusal interference offered by the retruded maxillary incisors must be relieved first to permit restoration of the disturbed balance of the muscles of mastication. When this is done, many times there is a spontaneous correction of the Class II relation and the remainder of treatment becomes routine. This biologic analysis and timed treatment permits the forward movement of the denture to keep pace with the downward and forward growth of basal structures and avoids embarrassing results such as have been experienced in this case.

I am sure Dr. Buchner will agree for in his remarks he said, "The photographs taken at the conclusion of treatment showed disappointing results. The lovely, straight profile and excellent balance in the original have changed to essentially a concave profile in spite of all the precaution taken in treatment to avoid such a result. A study of the composite tracing will show in some degree why this happened. While the lip area remained in essentially the same position, there has been considerable growth of the nose and mandible. Some growth has occurred at gonion and there is a great amount of appositional growth at pogonion." Here is cephalometric evidence that we may expect growth beyond thirteen years of age in girls. These growth changes must be taken into account in diagnosis and treatment planning.

It may be disturbing to some that they can no longer put all of their problems into a single worry, the worry of creating a double protrusion. It is high time to begin worrying just as much about creating a *double retrusion.* These cases, together with the other cases he has shown, offer further evidence that the slide rule or the static model diagnosis alone cannot be depended upon.

It is my opinion that orthodontics has progressed far enough into the future so that it can look back with a clear vision that characterizes hindsight and appraise with a critical eye where we stand. Since cephalometric studies were introduced into orthodontics some thirty years ago, perhaps no research weapon has ever been used with greater concentration by a profession. Used in the hope of finding not only when, where, in what places and in what directions the dentocranial complex grows but also, in the hope of finding some pattern, or averages or range of normals to which a patient could be satisfactorily treated. While this research has given the answers to many of these questions, the time has come that a review of this statistical knowledge be made and its often detrimental effect on diagnosis and treatment planning be brought to light as has been done by Dr. Buchner in this paper.

I believe that our profession can be justly accused of using this body of statistical knowledge compiled by cephalometric studies as a drunk uses a lamp post. An inebriate does not use a lamp post for light but for support. He has distorted its intended purpose. In the same way the orthodontist has distorted statistical knowledge by using it incorrectly for diagnosis, rather than as a research tool. As a tool, it sheds light on our problems, but, as an inflexible diagnostic entity, its usefulness is sadly limited.

Thus, we can see that cephalometrics is primarily a research instrument which has been invaluable in pushing forward our knowledge of growth and development. To the clinician it reveals the changes that have occurred during treatment and retention periods.

It has become increasingly evident that the diagnostician should consult the patient as well as the "wiggle". He should correlate cephalometric data with the biological changes that may be expected to occur, during and after treatment, as a result of orthodontic management and of the maturing of the patient.

As we learn to implement our mechanical skills and statistical findings with increased biologic awareness, the time may not be too distant when we can attain a synthesis of these elements. This would, indeed, be progress.