Case Report *

ROBERT R. MCGONAGLE, D.D.S.
Euclid, Ohio

GENERAL HISTORY

K. L. T. was a fourteen year old white female with a Cl.III malocclusion. She was tall (five feet, six inches), quiet, reserved, had good posture and was not unattractive considering the magnitude of the facial disharmony. The early history revealed a normal delivery and the period of infancy was uneventful. The patient had the usual childhood diseases which included whooping cough, measles, chicken pox, but not mumps. Tonsils and adenoids were removed at eight years of age. At the age of twelve she was struck by a car, shaken and bruised, but there were no apparent injuries. The patient later complained to her physician of aches in her joints and calves, and was told she had "growing pains". There were no other symptoms suggestive of rheumatic fever. At fourteen she had not reached menarche. Headaches were rare, the significance of which will be dealt with later. Her diet was comparable to the average American teenager's and was adequate in quantity and quality.

GENERAL CLINICAL PICTURE

The patient had a long face with evidence of mandibular prognathism and a definite concavity of the upper face (Fig. 1). The lower lip appeared rather full but the cheeks seemed somewhat hypotonic. The tongue was slightly large with faint indentations along the periphery. It rested on the floor of the mouth and, unfortunately, still does. The inter-occlusal space at the molars was approximately 4mm. clinically. The facial disharmony was not noticeably accentuated from rest to occlusion.

The naso-pharynx as seen from the lateral head plate appeared to be normal and the respirations were nasal. The patient was alert and had normal facial expressions. She was most cooperative during treatment and it is difficult to explain her subsequent lack of cooperation in wearing her upper retainer after active treatment. Speech was clear and distinct. Mastication, althought adequate, was restricted to some degree. Oral hygiene was excellent and the gingival tissue appeared healthy.

The dental x-rays showed the supporting bone to be of average density and trabeculation. There was no evidence of gross root resorption. The alveolar crests appeared intact and of normal height. The third molars were present.

FAMILY BACKGROUND

The family background proved to be highly disappointing as a source for determining possible etiological factors. Neither parent, an older brother, or the younger sister showed any Class III tendencies. K. L. T. at the present time is taller than any member of her family by several inches. There had been no family evidence of diabetes, thyroid, or other endocrine, abnormality.

ASSOCIATED MEDICAL THERAPY

It was felt that in the light of the general and clinical history the patient should be seen by an endocrinologist. The parents were most interested in following this suggestion.

*Presented at the meeting of the Mid-Western Component, Drake Hotel, Chicago Illinois, January 1953.

Fig. 1. Facial photographs of patient before treatment (top row) and after treatment (lower row).

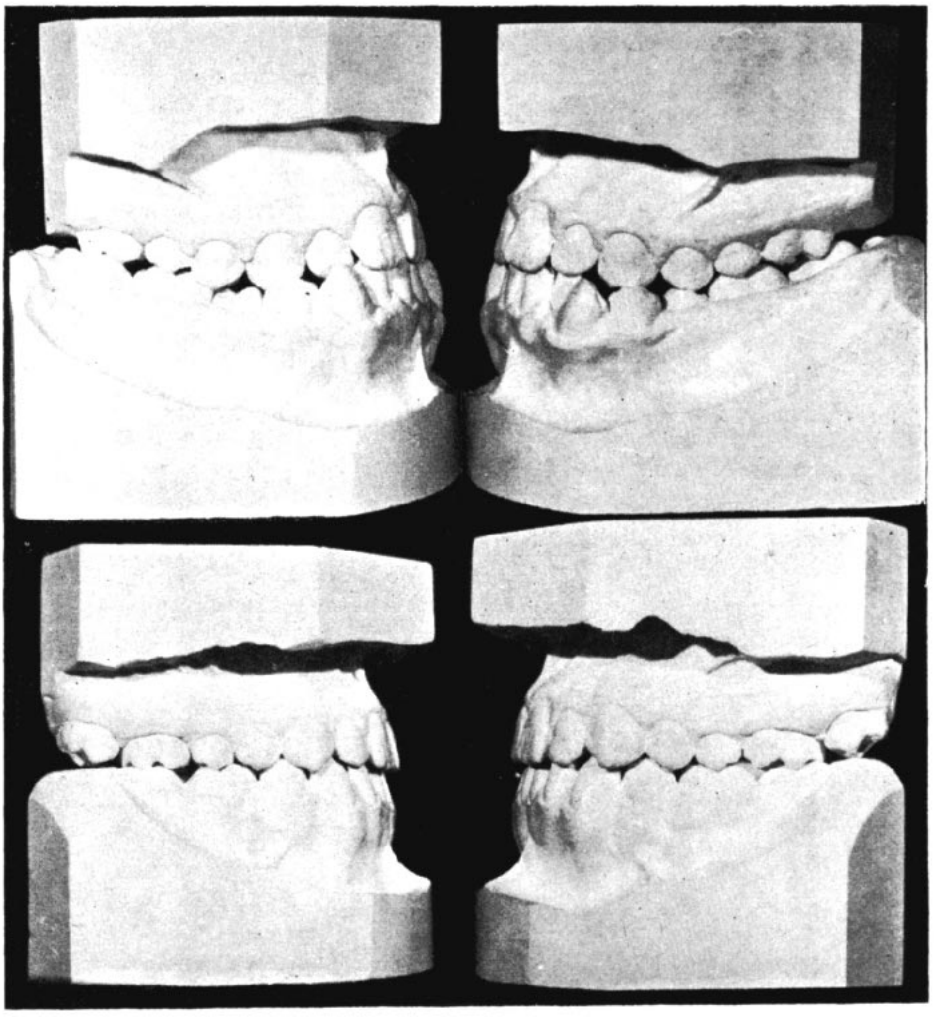

Fig. 2. Lateral views of plaster models. Top row, before treatment; lower row, after 24 months of treatment.

The endocrinologist reported that K. L. T.'s bone age was approximately six months behind her chronological age and that she would grow approximately three more inches in height. It was felt that endocrine therapy should be started. He prescribed an anterior pituitary factor which contained thyrotropic, gonadotropic and ACTH hormones. She was given lcc. of this combination every week for one year. The purpose of these injections was "to bring on her menstrual periods and slow down her growth". The menarche started soon after the injections were begun with an apparently normal cycle every thirty days lasting three, accompanied by cramps on the first which is a fairly good indication of ovulation. Success in slowing down the growth however, is open to question.

MODEL ANALYSIS

There was considerable contraction of the upper arch which had a partial

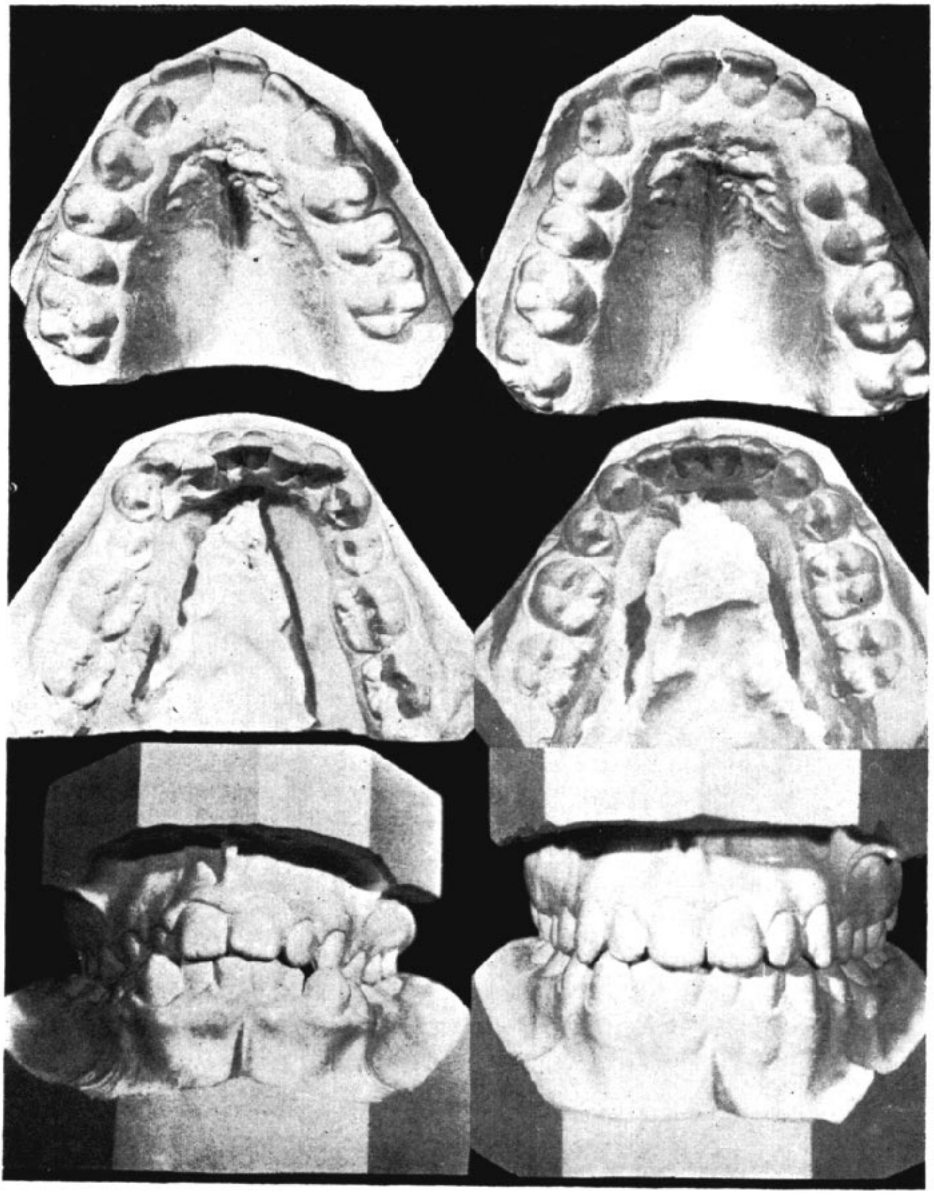

Fig. 3. Occlusal and front views of plaster models. On the left, before treatment; right, after treatment.

cross-bite relationship to the rather wide lower arch (Figs. 2 and 3). There were also some minor irregularities in the upper arch. The lack of tongue support in the palatal vault was considered a possible local etiological factor. The mid-line of the upper dental arch was approximately one millimeter to the right of the facial mid-line, using the palatal raphé as the point of reference.

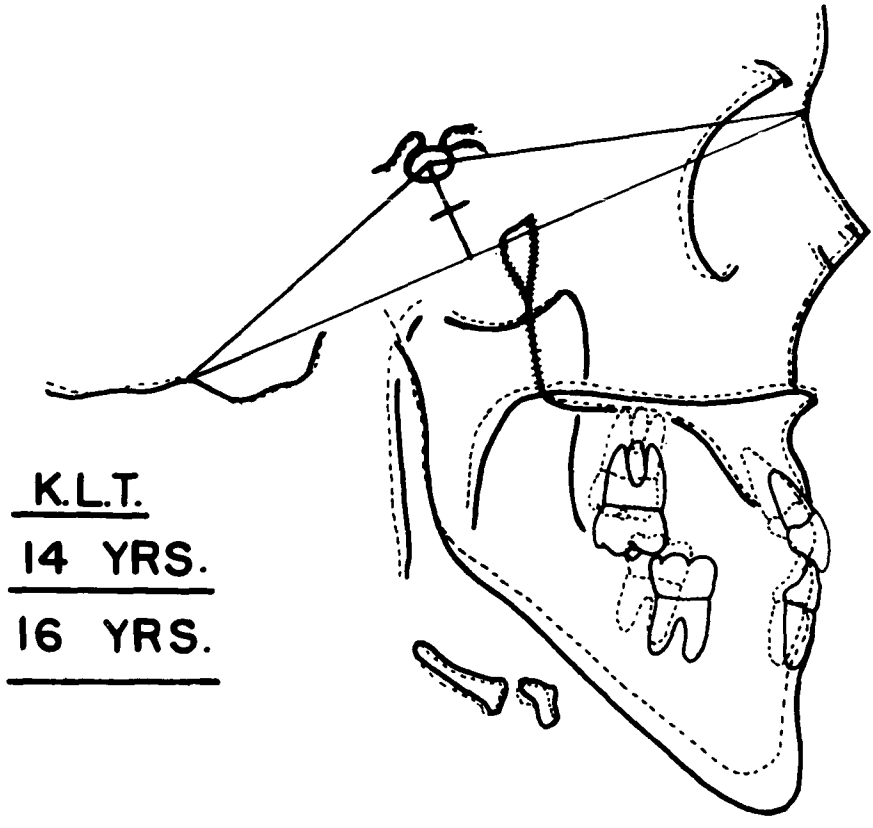

Fig. 4. Tracings before and after treatment, superposed in Bolton relation to show total facial changes. Note increased mandibular size and shift of molars.

The lower arch presented an even more serious problem. The lower anteriors were crowded, with the cuspids and the lower second bicuspids facing almost forward. A Class III molar relationship was present on both sides. The upper centrals and left lateral were not in Class III relationship.

CEPHALOMETRIC APPRAISAL

The most striking feature of the cephalometric picture was the extreme anterior facial height as related to the posterior facial height. Anteriorly, the percentage relationship of upper to total facial height was 42.5% (Fig. 4, broken line).

The mandible was quite typical of the Class III pattern. There was excessive vertical height in the menton area with a markedly obtuse gonial angle. The ramus was quite narrow and the condylar neck appeared rather long. A measurement from the occlusal plane in the molar area to the lower border of the mandible was considerably less than the same measurement in the anterior region. The mandibular plane was also very steep. Downs' angle of convexity[1] and A-B readings bore out the slightly "dished" appearance of the face and bony skeleton but the Y axis and facial angle were not excessive. The dental pattern, again using Downs' standards, showed the occlusal plane and interincisal values to be within the normal range but the denture was

poorly related to the bases supporting it (Table I).

TABLE I

Changes in Dentofacial Pattern (Downs Analysis) of K. L. T.

	Before	*After*
Facial Angle	89	90
Angle of Convexity	—4	—5.5
A-B to Facial Plane	+3	+2
Mandibular Plane	40	41.5
Y Axis	61	62
Occlusal Plane	+9	+3.5
Interincisal Angle	135	143
$\overline{1}$ to Mandibular Plane	—27.5	—34
$\overline{1}$ to Occlusal Plane	2.5	4.5
$\overline{1}$ to A-P Plane	5mm	4.5mm

The Wylie analysis[2] tended to substantiate the idea that the morphology of the mandible was the greatest factor in producing the undesirable picture (Table II). The maxillary underdevelopment when related to Wylie's figures was not excessive; however, a slight underdevelopment of this area, coupled with an overdevelopment of the mandibular length, added up to a score of plus seventeen which represents a very positive prognathic score.

TABLE II

Assessment of Anteroposterior Dysplasia (Wylie analysis) of K. L. T.

	Std.	*Pat.*	*Orth.*	*Prog.*
Glenoid Fossa to Sella	17	11		6
Sella to PTM	17	21	4	
Maxillary Length	52	49		3
PTM to Upper 6	16	15		1
Mandibular Length	101	112		11

There was very little encouraging information in the models, photographs, dental x-rays, or cephalometrics. However, I elected to treat the case without a surgical resection.

General Treatment Plan

The treatment plan called for expansion of the upper arch using expansion in the archwire and criss-cross elastics. Lower second bicuspids were to be extracted and first bicuspids moved distally until sufficient space was gained to re-align the anterior segment. After the lower dental arch was established as a unit and the cross-bite corrected, Class III elastics were to be instituted. The case was to be finished with the placement of correlated ideal arches. The edgewise appliance was used throughout.

Appliance

Upper: All upper teeth were banded and lingual spurs were placed on the molar and bicuspid bands. A series of steel arches, .016 through .020, were placed at three week intervals. Finally an .021 x .025 gold arch, with slight lingual crown torque and expansion, was used.

Lower: The first bicuspids, first molars and second molars were banded and the second bicuspids were removed. Sectional arches with loops were then used to retract the first bicuspids to contact the first molars. Following this phase of treatment, the anteriors were banded. The cuspids moved distally and rotated considerably while the above progress was taking place. An .021 x .025 arch was then placed and criss-cross elastics used to correct the cross-bite. Class III elastics were then initiated. When a fairly acceptable occlusion was attained, the case was retained. One must keep in mind the magnitude of the facial disharmony when the finished result is evaluated.

Supplemental Therapy

An attempt was made to educate the patient to keep the tongue away from the floor of the mouth so that it would have a more nearly normal position and action. The patient was instructed to hold a "Life Saver" against the palate with the tongue, and to swallow while doing so. It was also suggested that she practice the same exercise while opening the mouth as wide as possible.

RETENTION

Upper: A Hawley retainer was made, with an .015 x .036 labial steel wire, to maintain the expansion gained.

Lower: A lingual wire was soldered to bands on the first bicuspids and a labial arch was tied back to the second molars to prevent the extraction spaces from opening. This labial arch was removed after three months.

RESULTS AND CONCLUSIONS:

The models alone indicate a fair degree of success; the occlusal relationship was improved and the tissues appeared healthy. However, growth and development of the face is such an important factor in the treatment and stability of all cases, that I no longer examine only the occluded models in an attempt to evaluate results of treatment. Cephalometric analysis enables us to study the changes due to growth and development as well as to treatment.

To analyze the changes that were largely the result of growth, the tracings of head x-rays taken at the beginning and end of treatment were superimposed in the Bolton relation[3] (Fig. 4). The picture obtained is both striking and discouraging. The forward movement of point A has been very slight in comparison with that of B and pogonion. There was extreme downward and forward movement of gnathion. It was most encouraging to see that the sella turcica had not shown any demonstrable increase in size which tended to rule out the possibility of a pituitary tumor: in the true acromegalic a grossly distorted sella outline can be seen. Further, the extremities of the acromegalic show extreme blunting of both the fingers and toes. Wrist and foot x-rays were negative in this respect.

Using Dr. Downs' measurements, the skeletal changes during two years of treatment were analyzed (Table I). There was little change in the skeletal pattern. However, the changes that did occur were certainly not in a favorable direction. There was a slight increase in the mandibular plane angle even though Class III elastics were used. The fact that the A-B relationship improved very slightly while the angle of convexity is more marked tends to indicate that the denture is more recessive than at the beginning of treatment. The increase in both the facial angle and Y axis contribute to this picture.

The dental area, as could be expected, showed the greatest change.[4] The occlusal plane levelled considerably, largely due to the Class III elastics. The vertical change of the molars was most noticeable. The most undesirable change was the retraction of the lower incisors from minus 27.5 degrees to minus 34 degrees. The angular relation of the upper incisor to the lower incisor became 143 degrees, having changed from a more desirable 135 degrees. The lower incisor to occlusal plane reading was largely unaltered because the angles of both the occlusal plane and $\overline{1}$ to mandibular plane were markedly changed. Occlusal stability is now questionable in the light of these changes.

In an effort to analyze the changes in the maxilla and mandible and the teeth as related to these bones, the tracings were superimposed on the anteroposterior growth axis (Fig. 5). This "A-P" growth axis[5] is a zone which begins at the coronal suture superiorly, continues downward through the pterygomaxillary suture, and extends into the mandible inferiorly. This appears to be a stable plane as far as anterior-posterior growth is concerned. The posterior nasal spines of the maxillae were superimposed on this axis, keeping the palatal planes parallel. This superimpositioning shows that point A has moved slightly forward as has the upper incisor. The upper molar movement has been largely of a vertical

nature.

To superimpose the mandibles in similar fashion requires additional explanation. To establish a registration point on the mandible, a line is drawn tangential to the anterior border of the ramus. This line is joined by a line drawn through the alveolar crests of the lower teeth; the angle thus formed is bisected with a line extending to the internal angle of the mandible. A line is then drawn from this point to the highest curvature of antegonial notch. The point at which this line crosses the A-P growth axis is termed the registration point for the mandible. To compare mandibles, the "R" points are superimposed keeping the mandibular planes parallel (Fig. 5).

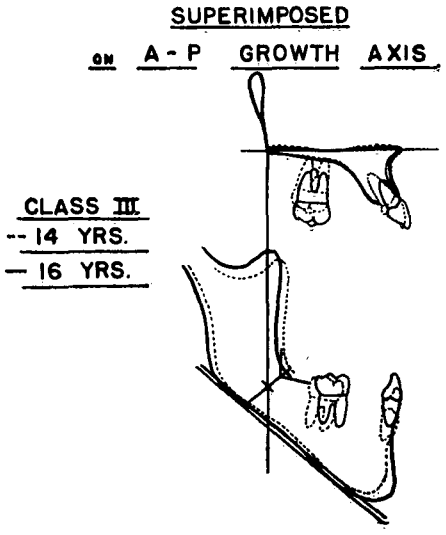

Fig. 5. Tracings before and after treatment, superposed to show respectively, maxillary and mandibular tooth changes. In effect, this method tends to remove changes due to growth.

In analyzing these tracings, note the increase in size of the mandible, both vertically and horizontally. There has been considerable remodeling of bone in the anterior region and change in the vertical position of the lower incisor. The lower molar has come forward to a marked degree but that is to be expected in an extraction case, particularly one which involves lower second bicuspids.

It was interesting to note the amount of labial alveolar process lost during treatment (Figs. 4 and 5). There may be some osteophytic bone which does not show on the x-ray due to its immaturity and consequently its lack of mineralization; however, follow-up records will be necessary to clarify this matter.

At the completion of treatment the patient was sixteen years of age, five feet, ten inches tall and had a finger tip-to-finger tip spread of seventy inches. She weighed one hundred thirty pounds and wore an eleven and a half shoe. It was on the basis of this increasing foot size and the long tapering fingers that the possibility of Marfan's syndrome was considered. This is manifested by arachnodactylia and such associated congenital defects as cardiac, pulmonary and visual disorders.

On the basis of the follow-up records it was felt that the patient should be re-examined by the endocrinologist. The additional medical studies revealed a normal heart and lungs. The visual field was normal, thus ruling out pressure on the optic nerve due to an over-growth of the pituitary body. There was no excessive nervousness suggesting hyperthyroidism. There was no enlargement of the liver or kidneys, a common finding in acromegaly. The physician simply concluded that we were dealing with a very tall, thin girl who showed no evidence of endocrine abnormality.

Comparison of K.L.T. and P.H.

It is interesting to compare K. L. T.'s tracing with that of another sixteen year old female patient, P.H., (Fig. 6)

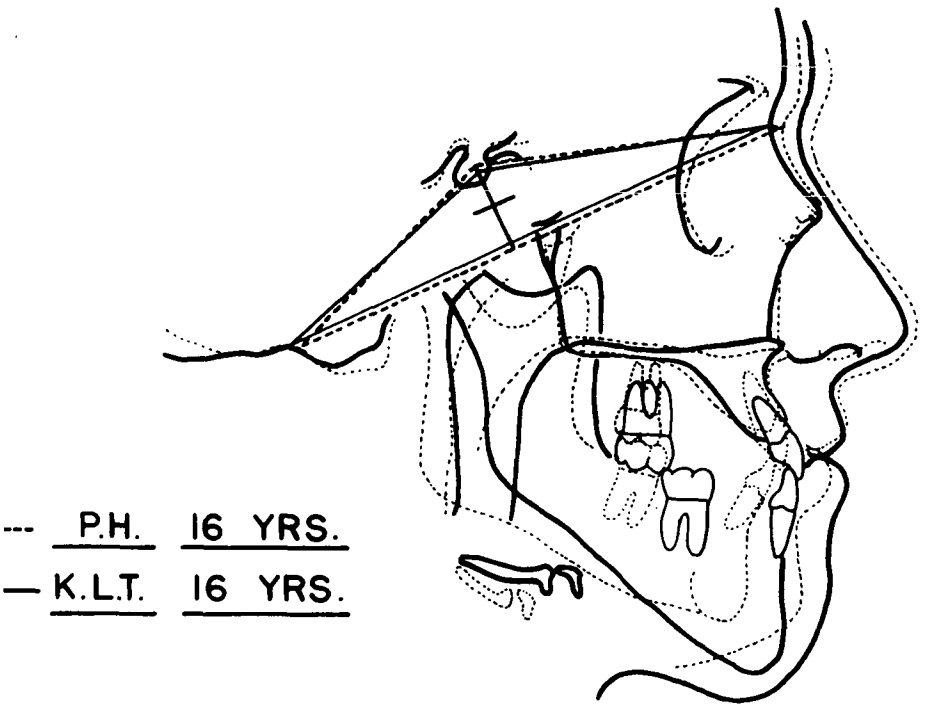

Fig. 6. Tracing of Class III patient superposed in Bolton relation on that of a 16 year old girl showing excellent facial development. See Table III for values of latter's dentofacial pattern according to the Downs analysis.

whose dentofacial pattern shows values closely approaching the means of the Downs measurements (Table III).

TABLE III

Dentofacial Pattern of Patient P. H.

Facial Angle	89
Angle of Convexity	0
A-B to Facial Plane	—4
Mandibular Plane	24
Y Axis	59
Occlusal Plane	9
Interincisal Angle	132
$\overline{1}$ to Occlusal Plane	22
$\overline{1}$ to Mandibular Plane	8
$\overline{1}$ to A-P Plane	5mm

The Bolton method of superposing tracings was used to compare the difference in these two faces. The most noticeable feature is the extreme anterior vertical height of the Class III patient. The anterior cranial base is shorter and the ramus width much narrower in the Class III. The gonial angle is quite obtuse and the mandibular length is quite striking by comparison. The tooth relationship will not be discussed because both cases have been treated.

When the two cases are compared using the A-P growth axis it is interesting to note that the maxillae compare favorably in length but the anterior vertical height of the Class III is considerably greater (Fig. 7).

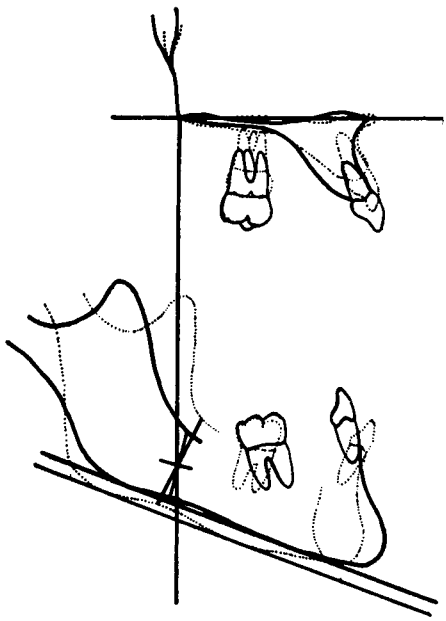

Fig. 7. Maxillary and mandibular comparisons, superposed on A-P growth axis, of Class III patient (solid line) and of patient having excellent facial development (broken line).

Summary

This concludes the case report of Class III malocclusion treated orthodontically and with endocrine therapy. I feel that the result is completely at the mercy of any developmental growth changes that may or may not occur in this face. If growth continues for any length of time at the present rate, then perhaps it would have been best to postpone treatment and resorted to a mandibular resection.

The case is no longer under retention and, when last seen, some of the original undesirable features had returned. The upper arch had narrowed to some degree and the cross-bite was showing some tendency to return but occlusal correction was holding fairly well. Complete records will be taken again when the case is one year out of retention.

21801 *Lake Shore Blvd.*

Bibliography

1. Downs, W. B. Variations in Facial Relationships; Their Significance in Treatment and Prognosis. *Amer. Jour. Ortho.*, 34, 812, 1948.
2. Wylie, W. L., The Assessment of Anteroposterior Dysplasia. *Angle Ortho.*, 17, 97-109, 1947.
3. Broadbent, B. H., The Face of The Normal Child. *Angle Ortho.* 7, 183-208, 1937.
4. Brodie, A. G., Downs, W. B., Goldstein, A., Myers, E., Cephalometric Appraisal of Orthodontic Results. *Angle Ortho.* 8, 261-351, 1938.
5. Broadbent, B. H., Ontogenetic Development of Occlusion, in Development of Occlusion, University of Pennsylvania Press, Philadelphia, 1941.