Borderline Malocclusions

F. M. Hapak, D.D.S.
R. A. Hanes, D.D.S.
M. M. Stoner, D.D.S.
J. T. Lindquist, D.D.S.
J. M. Vorhies, D.D.S.
Indianapolis, Indiana

Renewed interest in different concepts of treatment in orthodontics can be compared to a sine curve, that is to say that interest comes and goes. As opposed to the above there is a continued high level of interest in the management of borderline cases. It is this factor which led to make this report, plus a genuine interest in the fact that no two cases are alike. To elaborate on this sentence will provide our answer to the "why" of this writing. At the same time this paper is not to be regarded as an evaluation of the great number of considerations needed to arrive at a diagnosis. Rather, it would be preferable to refer to this as a specific report on a subject which has little specificity.

The solution of the problems relating to a particular malocclusion quite frequently varies among the members of the group. Cases involving the question of removal of teeth to achieve a result elicit the most discussion.

This paper is not intended to serve as a reason for or against removal of teeth in orthodontics. It is, rather, to serve as a positive argument for careful analysis of case histories, models, cephalometric and periapical radiographs and photographs. This analysis should formulate an individual treatment plan for that case. Often an alternate treatment plan is necessary since the resolution of a particular problem is not apparent. We feel that the dilemma, with which we are often faced when searching for the solution to the borderline case, is really not a dilemma at all. Possibly it may be the propensity of the operator to follow a school of treatment dogmatically, without any deviation. Or there may be a lack of initiative to try new things simply because he has heard that if he treats a certain case thusly it will always do thus.

There is a need in orthodontics for individual thought and implementation. It is not possible at this time to go to stereotyped treatment. The human head and face are not stereotyped. We must treat each case individually and consider such things as facial esthetics, stability of denture and damage to the denture. Becoming enamored with particular phases of orthodontics, be it in the realm of diagnosis or treatment, is a common failing and is akin to not seeing the forest for the trees.

The cases selected for this report we consider to be borderline. In this issue we will present the original records and a questionnaire. We ask the reader to study the cases and write down his impressions as to how he would treat them. In the next issue we will present our results and the compilation of the questionnaire submitted to two groups of orthodontists.

These cases were treated by the same basic appliance with individual variations of mechanics. The methods of diagnosis were different. Differences in diagnosis can be ascribed to individualism since all of us have similar backgrounds and objectives. All cases had models, dental x-rays, cephalometric headplates and photographs.

CASE 1

I. *Age, Sex* — Male, age 11 years.

II. *General Examination*

Physical History — No pertinent information offered.
Habits — None apparent.
Speech Disorders — None.
General Development — Normal for his age.
Familial Genetic Characteristics — Mother exhibited a severe Class II, Division 1 malocclusion.

III. *Dental History*

Deciduous Teeth — Normal.
Traumatic Injuries — The incisal third of the upper left central incisor was fractured at the age of eight years.
Missing Teeth — None.

IV. *Clinical Examination*

Muscular

Muscle Tonicity — The various areas of musculature appear to have adequate tonus.
Lips — The lower lip has an abnormal roll due to the occlusion while the upper lip is prominent for the same reason.
Chin — The chin musculature appears to be of normal attitude.
Tongue — The tongue function is good with no demonstrable deviations.

Functional

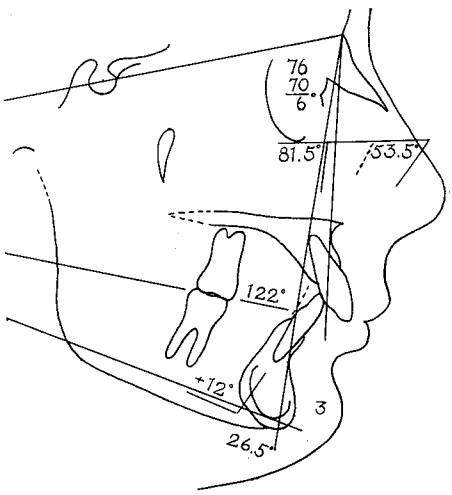
1. Freeway Space — It is within normal limits at five mm.
2. Path of Closure — Stable
3. Swallowing — Normal

V. *Occlusion*

This is a Class II, Division 1 malocclusion with the molars, bicuspids and cuspids assuming a full Class II cuspal relation. The lower anterior teeth are flared anteriorly with generalized spacing. The upper anterior teeth display a slight arch length problem. The curve of spee is excessive. The overbite is eighty per cent while the overjet measures twelve mm.

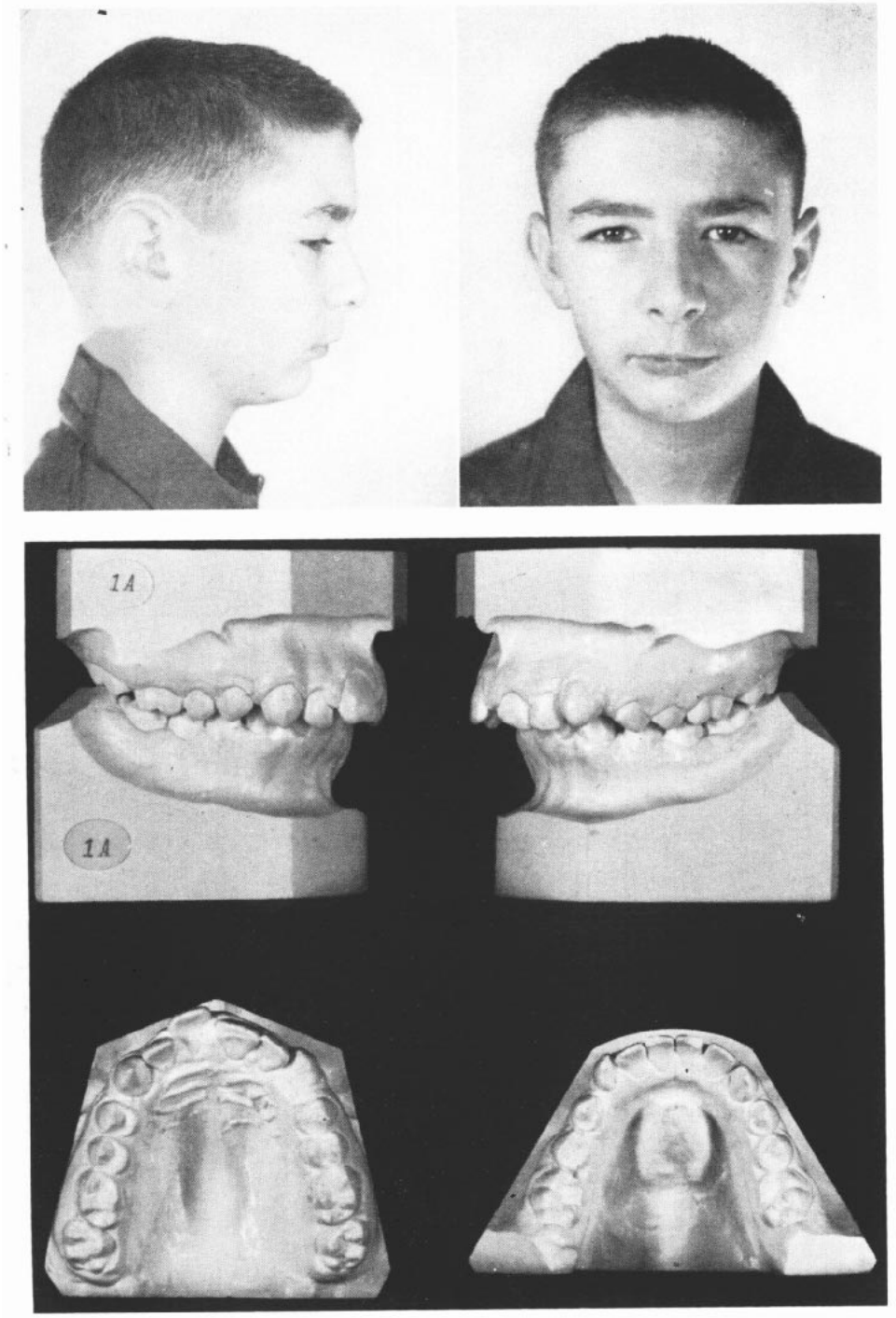
VI. *Dental X-rays*

Third Molars — Present
Eruption Level — Normal
Root Form or Closure — The roots of all four of the second bicuspids are still open at the apices while the roots of the remaining erupted teeth are practically closed.



CASE 1

SNA	76.0°
SNB	70.0°
ANB	6.0°
$\overline{1}$ to NB	26.5°
Fo to NB mm	3.0
$\underline{1}$ to $\overline{1}$	122.0°
Facial Angle	81.5°
$\overline{1}$ to Mand. Plane	+12.0°
FMA	24.5°
FMIA	53.5°



CASE 2

I. Female, Age 11 years, 6 months.

II. *General Examination*

Physical History — Usual childhood diseases were experienced with no complications.

Habits — Perverted swallowing evidenced by tongue thrusting forward against incisors during swallowing act.

Speech Disorders — No speech defects were evident.

General Development — Normal in all respects for age.

Familial Genetic Characteristics — Older male sibling previously treated for similar malocclusion with highly satisfactory results. Excellent cooperation and growth were experienced.

III. *Dental History*

Normal Deciduous Dentition — with eruption of permanent dentition perhaps earlier than average.

Traumatic Injuries — None evidenced from the history.

Missing Teeth — All permanent teeth present except unerupted second and third molars.

IV. *Clinical Examination*

Muscular

Lips normally parted unless closed with effort and evidence of strain. Very short upper lip as frequently seen with disuse.

Hypertonic mentalis

Tongue size and appearance.

Normal as far as could be determined.

Functional

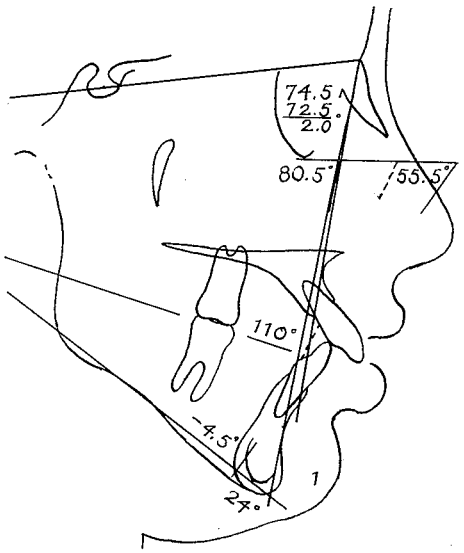
Both freeway space and path of closure appear normal. A perverted swallowing habit present in which there appears to be a sucking action in the orbicularis oris area coupled with a rolling forward of the lower lip as it is drawn lingually against the lower anteriors and lingual to the upper incisors.

V. *Occlusion*

Buccal segments occlude end-to-end or with maxillary teeth slightly forward of end-to-end. Mandibular incisors contact gingivae lingual to maxillary incisors.

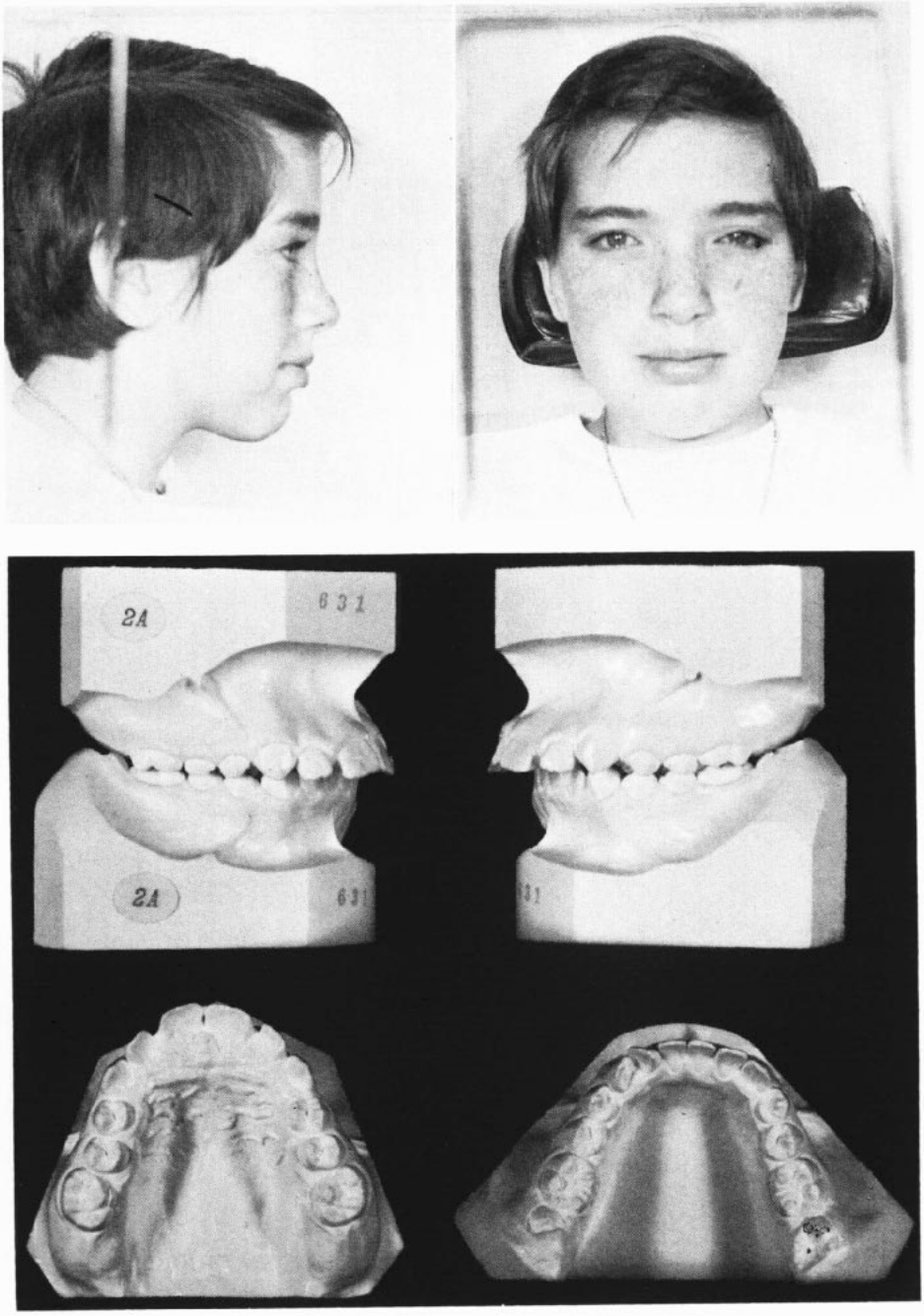
VI. *Dental X-rays*

Full complement of teeth including unerupted third molars. All teeth anterior to and including first permanent molars fully erupted. Mandibular second molars in process of eruption. Maxillary second molars unerupted. Root apices closed except bicuspids and second molars which are nearly closed.



CASE 2

SNA	74.5°
SNB	72.5°
ANB	2.0°
$\overline{1}$ to NB	24.0°
Po to NB mm	1.0
$\underline{1}$ to $\overline{1}$	110.0°
Facial Angle	80.5°
$\overline{1}$ to Mand. Plane	—4.5°
FMA	39.5°
FMIA	55.5°



CASE 3

I. Female, Aged 14 years, 2 months.

II. *General Examination*

Physical History — The usual childhood diseases without complications were experienced.

Habits — There was no evidence of present habits nor history of habits.

Speech — Appeared to be normal in all respects.

General Development — Healthy, well-developed young female, perhaps slightly more mature than average for age.

Familial Genetic Characteristics — Both parents showed evidence of some arch length problems. Nothing of a general physical nature deemed significant.

III. *Dental History*

Deciduous Teeth — Prolonged retention of deciduous teeth past the average age of loss.

Traumatic Injuries — No history of any injury.

Missing Teeth — All teeth erupted and present except third molars, upper left cuspid and second bicuspid.

IV. *Clinical Examination*

Muscular

Normal muscular development and tonicity except for hypertonic mentalis. Tongue normal.

Functional

Freeway space appears slightly excessive, 4-5mm.

Path of closure — Appears to be normal.

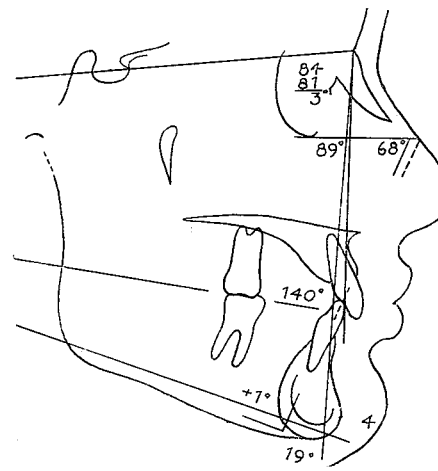
Swallowing — Appears to be normal.

V. *Occlusion*

Posterior segments in Class I occlusion with a slight Class II tendency. Anterior segment in Class II occlusion.

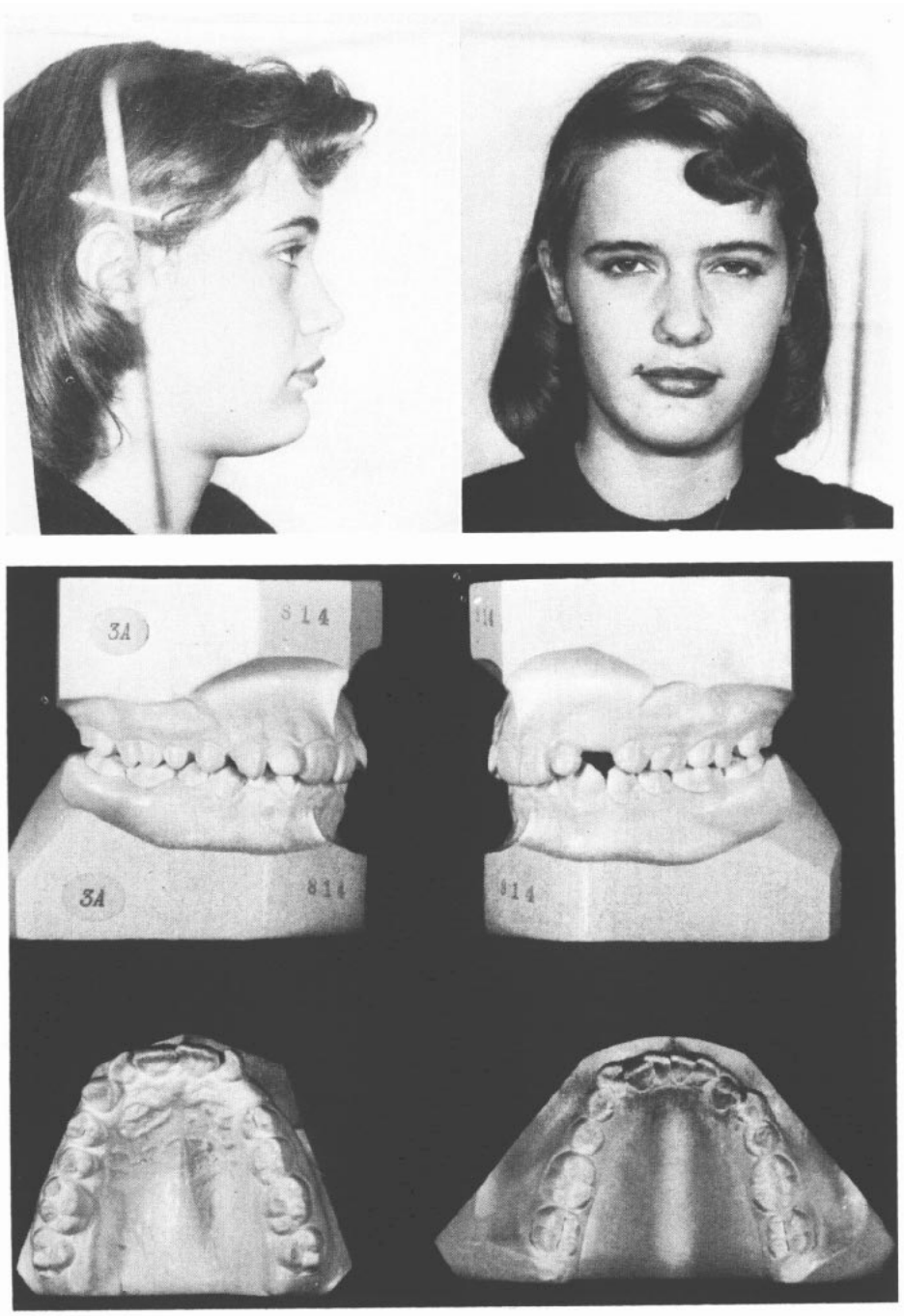
VI. *Dental X-rays*

Third molars are present. All other permanent teeth are fully erupted except the upper left cuspid and second bicuspid. Maxillary left deciduous second molar is in place with no follicular space around the bicuspid crown. The maxillary left cuspid appears to be positioned palatally.



CASE 3

SNA	84.0°
SNB	81.0°
ANB	3.0°
$\overline{1}$ to NB	19.0°
Po to NB mm	4.0
$\underline{1}$ to $\overline{1}$	140.0°
Facial Angle	89.0°
$\overline{1}$ to Mand. Plane	+1.0°
FMA	21.5°
FMIA	68.0°



CASE 4

I. The case demonstrated here is a boy, 13 years old.

II. *General Examination*

This boy was average in height and weight. His past physical history had been uneventful. His speech was good and there were no apparent habits affecting the development of the mouth or teeth. He was of North European genetic origin.

III. *Dental History*

This boy had a low caries index. He had suffered no injuries that would affect development of the teeth. The deciduous teeth were normal with no unusual developmental eruptive patterns.

IV. *Clinical Examination*

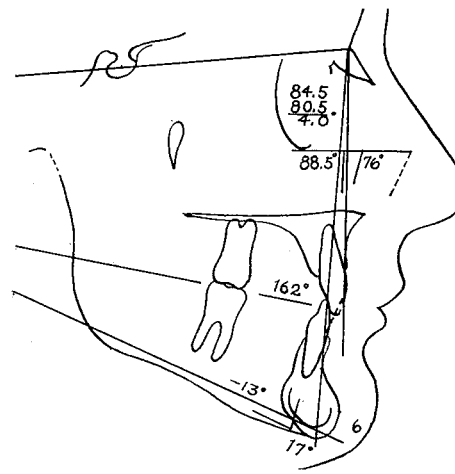
Examination showed a thin-lip type facial musculature with thick padding at the chin. The tongue was in good position and of average size. Functional examination revealed a rather large freeway space. The path of closure was vertical. Swallowing was normal.

V. *Occlusion*

The patient had a Class II, Division 2 malocclusion with a bilateral crossbite. There was approximately an eighty per cent overbite. The canines were unerupted with the spaces almost completely closed.

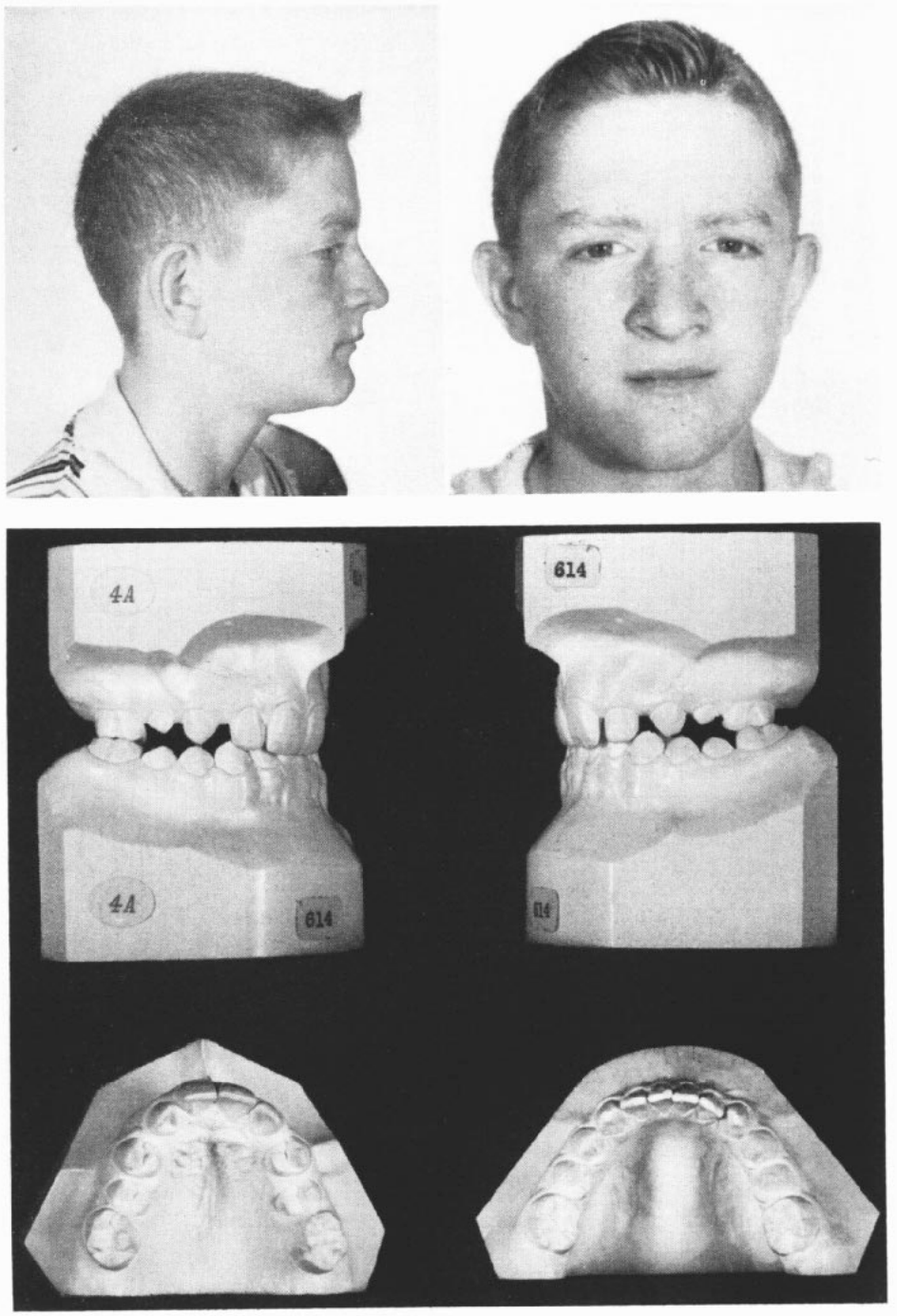
VI. *Dental X-rays*

Intra-oral radiographs revealed normal root development. The lower left second molar was erupted with third molars creating a crowded situation. The root apices of the maxillary canines and second bicuspids were still open. The maxillary canines had large follicular sacs. The positions of the unerupted canines were midway in the alveolar processes.



CASE 4

SNA	84.5°
SNB	80.5°
ANB	4.0°
$\overline{1}$ to NB	17.0°
Po to NB mm	6.0
$\underline{1}$ to $\overline{1}$	162.0°
Facial Angle	88.5°
$\overline{1}$ to Mand. Plane	—13.0°
FMA	27.0°
FMIA	76.0°



CASE 5

I. The case presented here is a girl, 12 years old.

II. *General Examination*

This girl was fully developed physically. Her height was five feet, six inches, and she weighed one hundred twenty pounds. Her speech was excellent with no apparent habits affecting the mouth and lip musculature.

III. *Dental History*

The past dental history was insignificant. The deciduous teeth were in Class I occlusion with no arch length problems. Eruptive patterns were normal, and the caries index was low. She had had the usual childhood diseases. At age two she had contracted a severe case of measles which may have contributed to some enamel markings on the central incisors. The patient had been a finger sucker until age five at which time her tonsils and adenoids were removed and the habit ceased.

IV. *Clinical Examination*

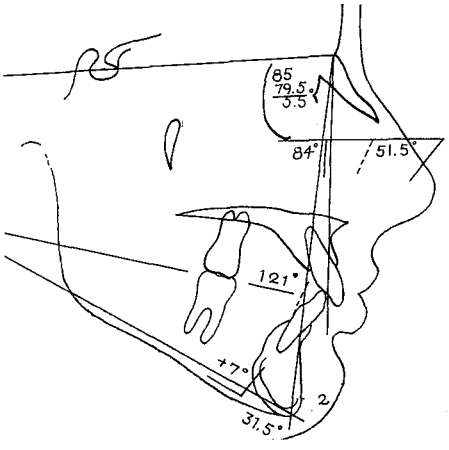
Examination of the muscle tissues around the mouth revealed well-developed features with some fullness in the lip musculature. The tongue was in normal position. There were no significant abnormalities nor any unusual position or directional activity of the mandible. The path of closure was upward and forward. Swallowing was normal.

V. *Occlusion*

This was a Class II, Division 1 type malocclusion with a basic Class I skeletal relationship. The upper and lower first molars were end-to-end with a four to five millimeter overjet. There was an arch length insufficiency, due to overlapped contacts and excessive curvature of the mandibular arch, which measured approximately five and one-half to six millimeters. A comparable insufficiency also existed in the maxillary arch.

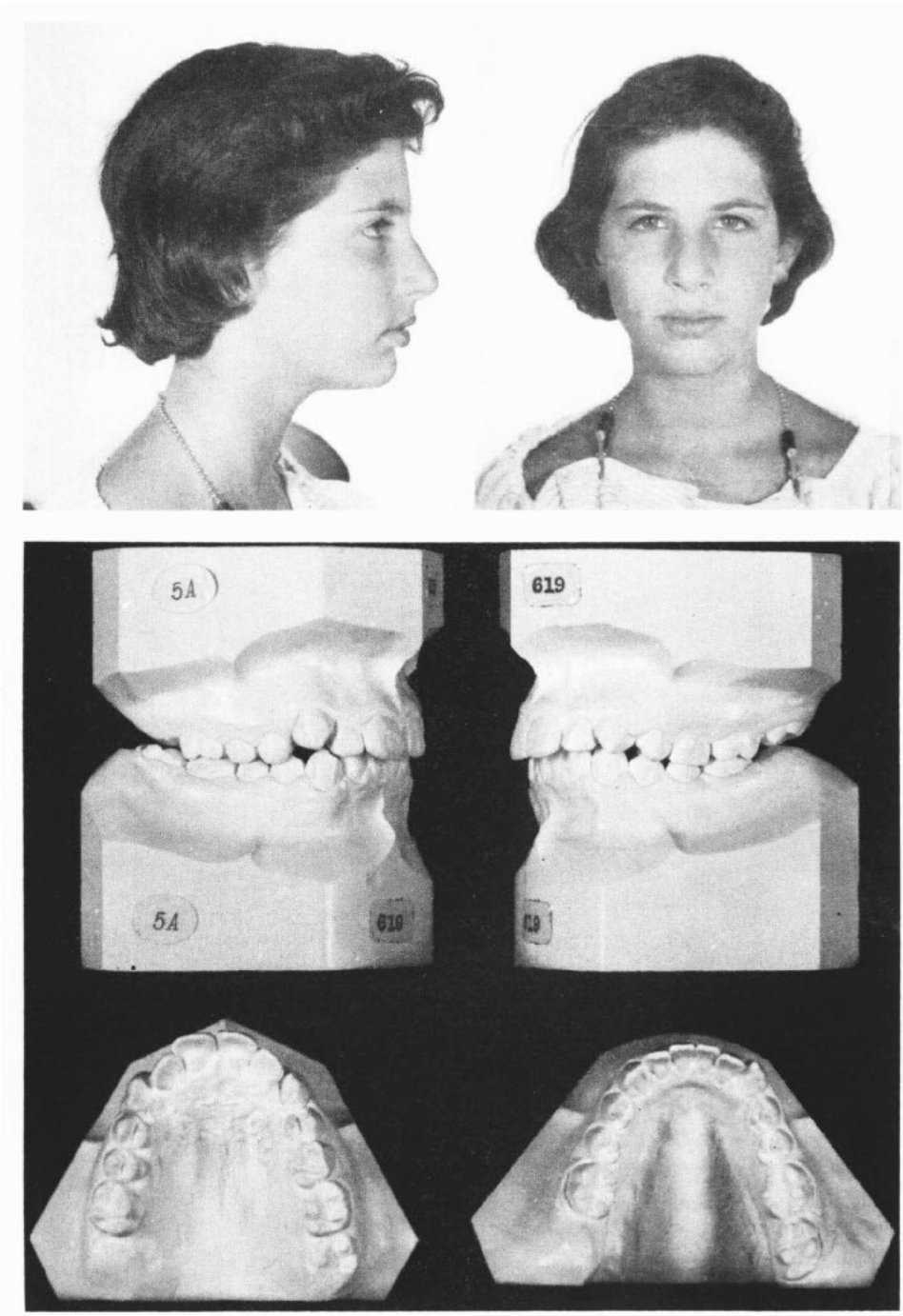
VI. *Dental X-rays*

Intra-oral radiographs revealed complete root formation of all teeth. The maxillary second molars were in the process of eruption and the lower right second molar was completely erupted. The lower left second molar was impacted against the distal surface of the first molar. There were no third molars developing.



CASE 5

SNA	85.0°
SNB	79.5°
ANB	5.5°
$\overline{1}$ to NB	31.5°
Po to NB mm	2.0
$\underline{1}$ to $\overline{1}$	121.0°
Facial Angle	84.0°
$\overline{1}$ to Mand. Plane	+7.0°
FMA	31.5°
FMIA	51.5°



CASE 6

I. The case demonstrated here is a boy, 11 years old.

II. *General Examination*

This boy was in excellent physical condition. He was rather short and stocky.Past medical history revealed that the tonsils and adenoids had been removed at age seven and that he had had the usual childhood diseases.

III. *Dental History*

The past dental history was not significant except that, according to the parents, the child had "protruding" teeth in the deciduous dentition. An active thumbsucking habit existed until about age seven and prior to the eruption of the maxillary incisors. The caries index was low and tooth formation was excellent.

IV. *Clinical Examination*

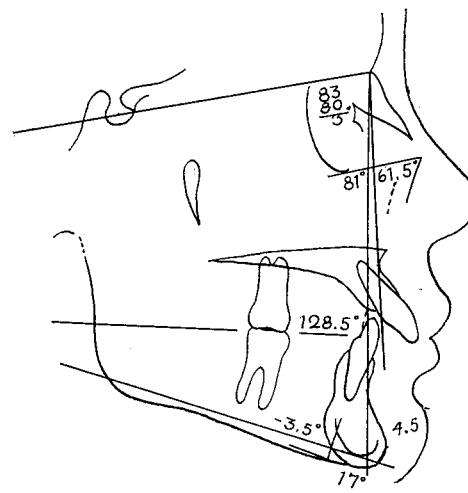
Examination of the muscle tissues revealed a rather flaccid type of lip musculature. The lower lip was thick and flabby, resting inside the maxillary incisors. The sulcus, or curvature of the lower lip, was excessive with apparent hypertonicity of the mentalis muscle. His tongue was normal in function and size. Functional analysis revealed a freeway space of about five millimeters. The path of closure was upward and forward. Swallowing was normal.

V. *Occlusion*

This case was typical Class II, Division 1 malocclusion with an excessive curve of spee in the mandibular arch. The lower anterior teeth were striking the palate. However, they did not seem to be causing any traumatic irritation in that area.

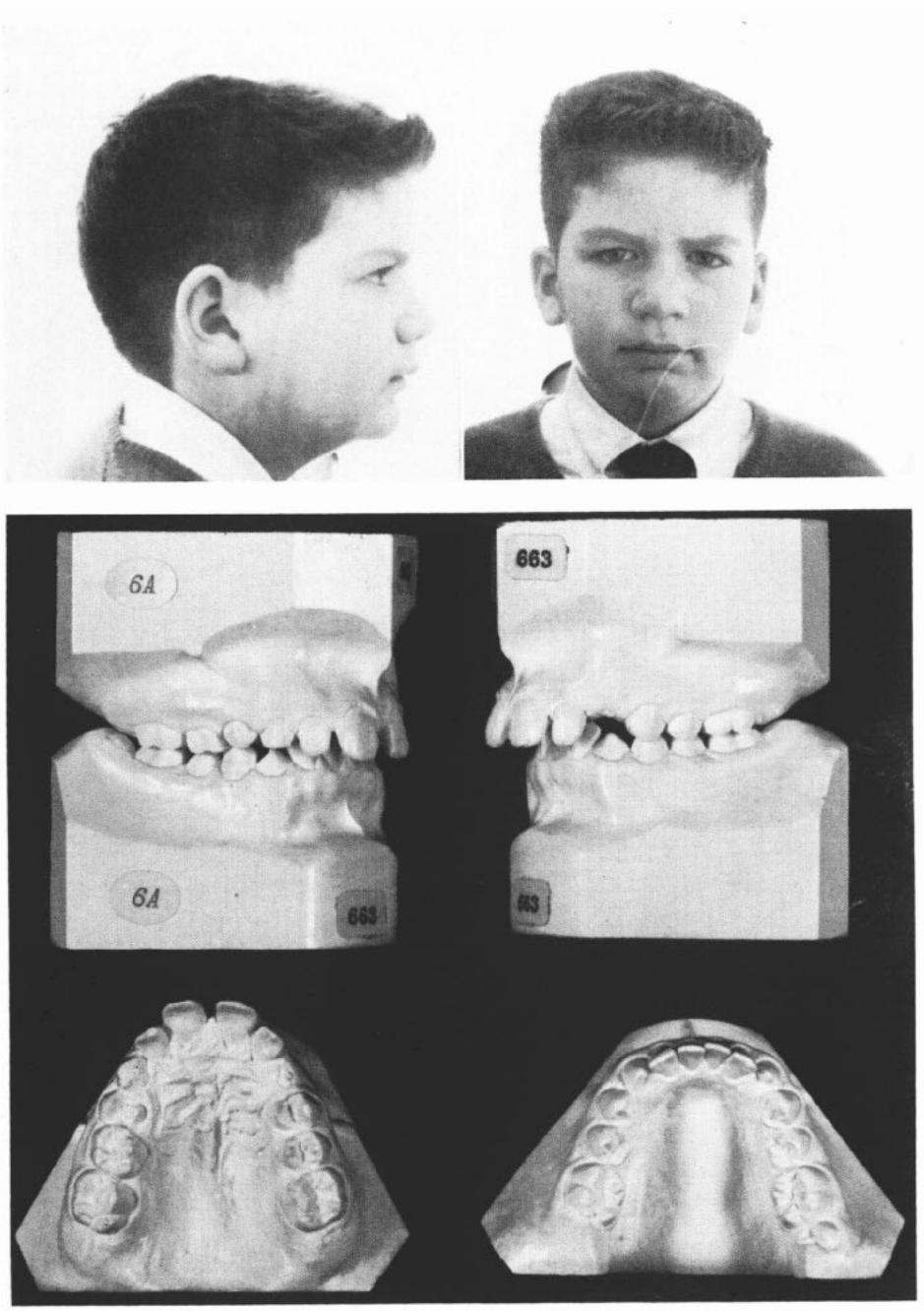
VI. *Dental X-rays*

Intra-oral radiographs taken about two months prior to the start of treatment revealed that the maxillary unerupted canines had two-thirds of root development completed and were in seemingly good position. The apices of the first and second bicuspids, as well as those of the second permanent molars, were still incompletely formed. The second permanent molars were in the process of erupting and were in a good position. The third molars were not discernible on the intra-oral radiographs.



CASE 6

SNA	83.0°
SNB	80.0°
ANB	3.0°
$\overline{1}$ to NB	17.0°
Po to NB mm	4.5
$\underline{1}$ to $\overline{1}$	128.5°
Facial Angle	81.0°
$\overline{1}$ to Mand. Plane	—3.5°
FMA	32.0°
FMIA	61.5°



CASE 7

I Patient is a boy age 13 years, 4 months at the start of treatment.

II. *General Examination*

Physical History — Questioning revealed no history of prior medical problems of major importance. An obstruction of the nose is present making nasal breathing more difficult but still possible.

Habits — There were no habits present that would have any relationship to the malocclusion.

Speech Disorders — Speech was normal.

General Development — Normal development present. Thin constitutional type and somewhat slow general growth and development.

Familial Characteristics — None present that would affect the malocclusion.

III. *Dental History*

Deciduous Teeth — None present.

Traumatic Injuries — None present.

Missing Teeth — None.

IV. *Clinical Examination*

Muscular

Muscle Tonicity — Normal, patient has nicely balanced facial appearance with resultant normal muscular balance.

Lips — Normal.

Chin — Normal.

Tongue — No abnormality present.

Functional

Freeway space — Average.

Path of closure — Normal.

Swallowing — No abnormality present.

V. *Occlusion*

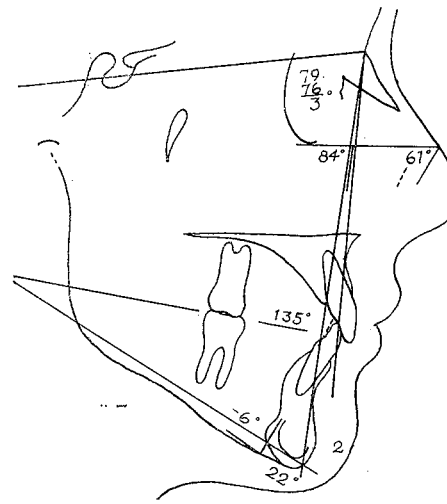
Class I occlusion characterized by crowding and rotations of the upper and lower anteriors. A moderate overbite (fifty per cent) is present and a two mm overjet. Class I buccal occlusion present.

VI. *Dental X-rays*

Third molars — Developing buds present.

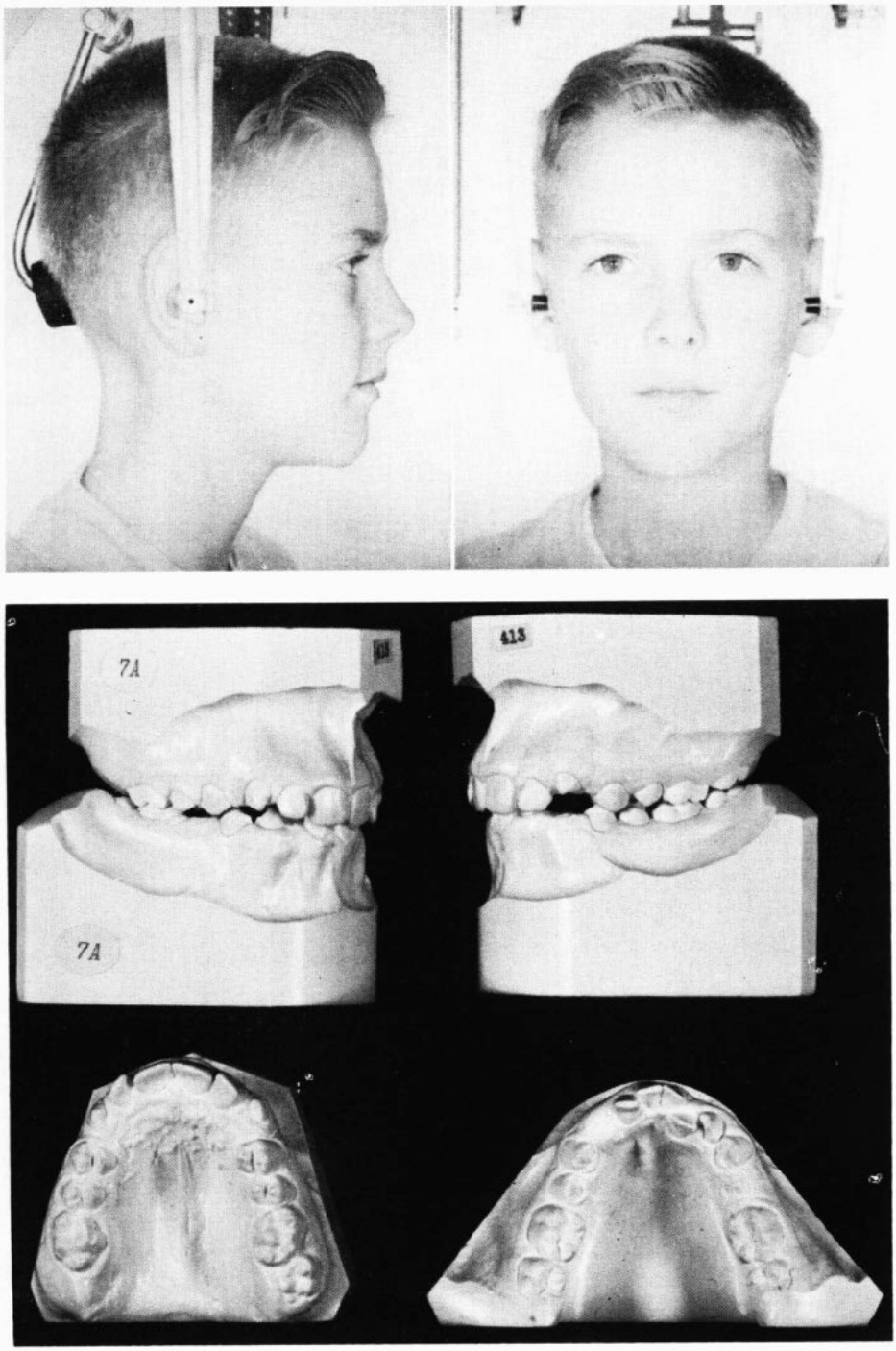
Eruption level — Definitely behind average.

Root form or closure — Normal.



CASE 7

SNA	79.0°
SNB	76.0°
ANB	3.0°
$\overline{1}$ to NB	22.0°
Po to NB mm	2.0
$\underline{1}$ to $\overline{1}$	135.0°
Facial Angle	84.0°
$\overline{1}$ to Mand. Plane	—6.0°
FMA	35.0°
FMIA	61.0°



CASE 8

I. Patient is a girl age 12 years, 7 months at start of treatment.

II. *General Examination*

Physical History — Questioning revealed no history of prior medical problems. Normal physiology in every regard as far as could be ascertained from medical history.

Habits — There were no habits present that would have any relationships to the malocclusion.

Speech Disorders — Speech normal.

General Development — Well-developed girl who was large for her age. General growth and maturity slightly above average.

Familial Characteristics — None present that would affect the malocclusion. Mother has almost ideal occlusion.

II. *Dental History*

Deciduous Teeth — None present.

Traumatic Injuries — None present.

Missing Teeth — Lower right second deciduous molar was extracted prematurely.

IV. *Clinical Examination*

Muscular

Muscle Tonicity—Normal, patient has pleasing facial appearance with resultant muscular balance.

Lips — Normal.

Chin — Normal.

Tongue — No abnormality present.

Functional

Freeway space — Slightly excessive.

Path of closure — Normal.

Swallowing — No abnormality present.

V. *Occlusion*

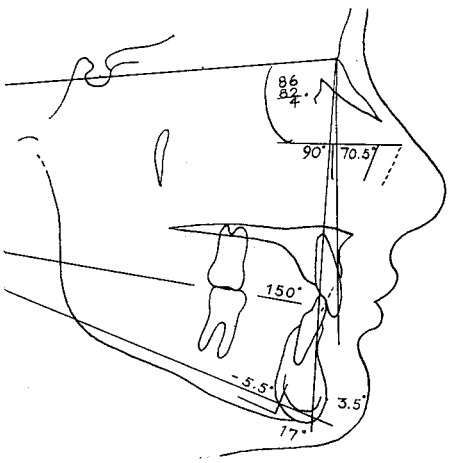
Class I occlusion with a severe (ninety per cent) overbite and two mm overjet. Molars on lower right side apparently have drifted mesially. There is less than half the required space for the unerupted lower right second bicuspid.

VI. *Dental X-rays*

Third molars — Developing tooth buds present.

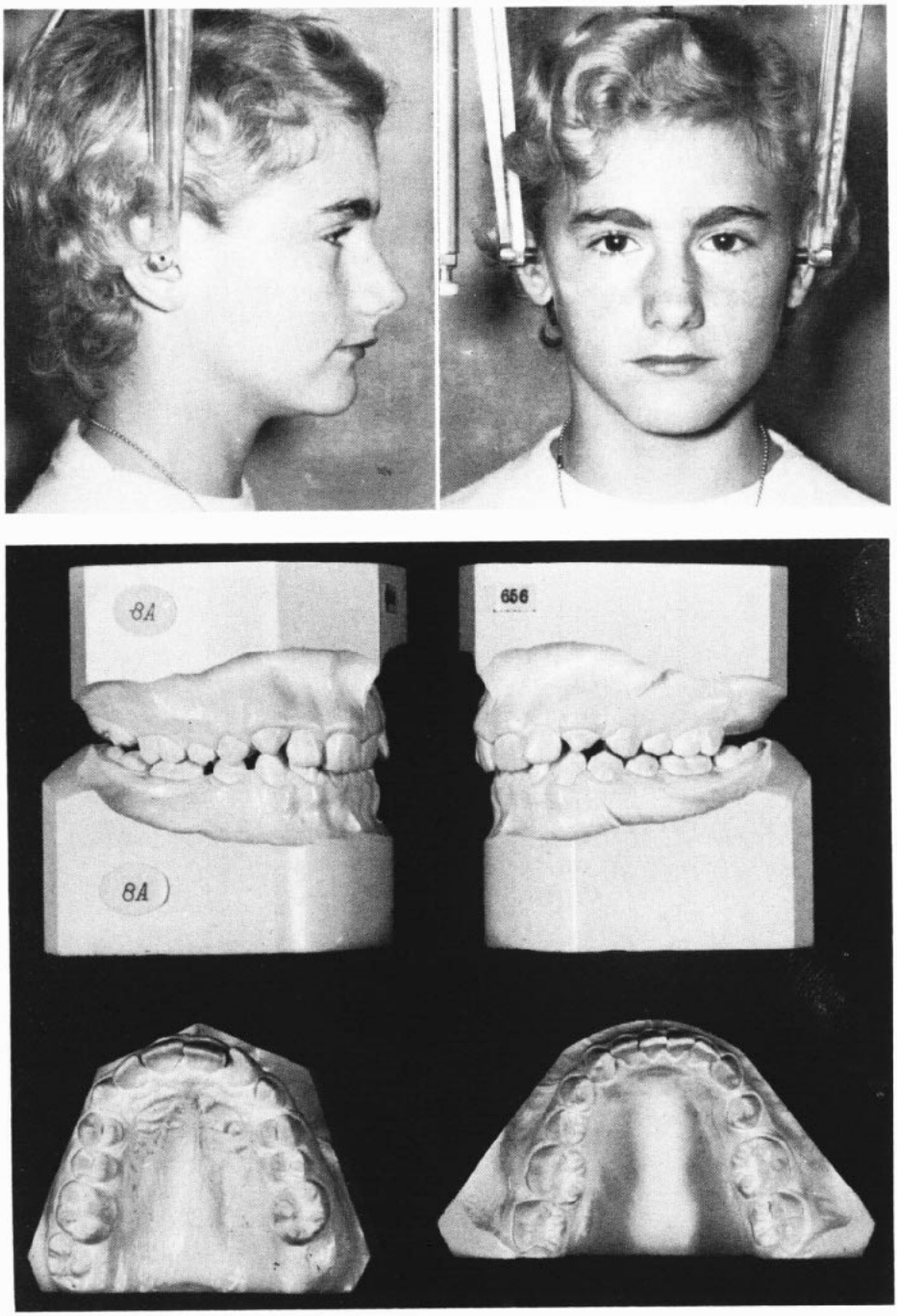
Eruption level — Slightly behind average.

Root form or closure — Normal.



CASE 8

SNA	86.0°
SNB	82.0°
ANB	4.0°
$\overline{1}$ to NB	17.0°
Po to NB mm	3.5
$\underline{1}$ to $\overline{1}$	150.0°
Facial Angle	90.0°
$\overline{1}$ to Mand. Plane	—5.5°
FMA	25.0°
FMIA	70.5°



CASE 9

I. Age 12 years, 1 month. Sex female.

II. *General Examination*

Physical History — Normal, as ascertained from questioning parents.
Habits — None apparent.
Speech Disorders — No speech defects were evident.
General Development — Slender constitutional type.
Familial Genetic Characteristics — Mother and father had normal occlusions and normal skeletal relations.

III. *Dental History*

Deciduous Teeth — Apparently normal occlusion.
Traumatic Injuries — None evidenced according to history.
Missing Teeth — None.
Caries Experience — Average as experienced in this area.

IV. *Clinical Examination*

Muscular

Muscle Tonicity — Normal as ascertained at chair.
Lips — Superior lip thin in lateral contour, but with sufficient tone. Inferior lip normal in contour and tone.
Chin — Normal to firm for age and sex.
Tongue — Size normal but position low in relation to palate.

Functional

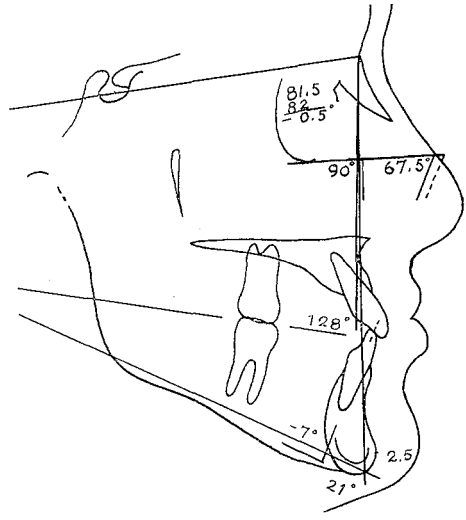
Freeway space — Within normal range.
Path of closure — Mandibular shift to right one mm upon closure.
Swallowing — Dynamics would be considered in normal range.

V. *Occlusion*

Class I occlusion with a Class III tendency. Narrow maxillary arch with an inlocked left lateral. Generalized spacing in mandibular buccal segments.

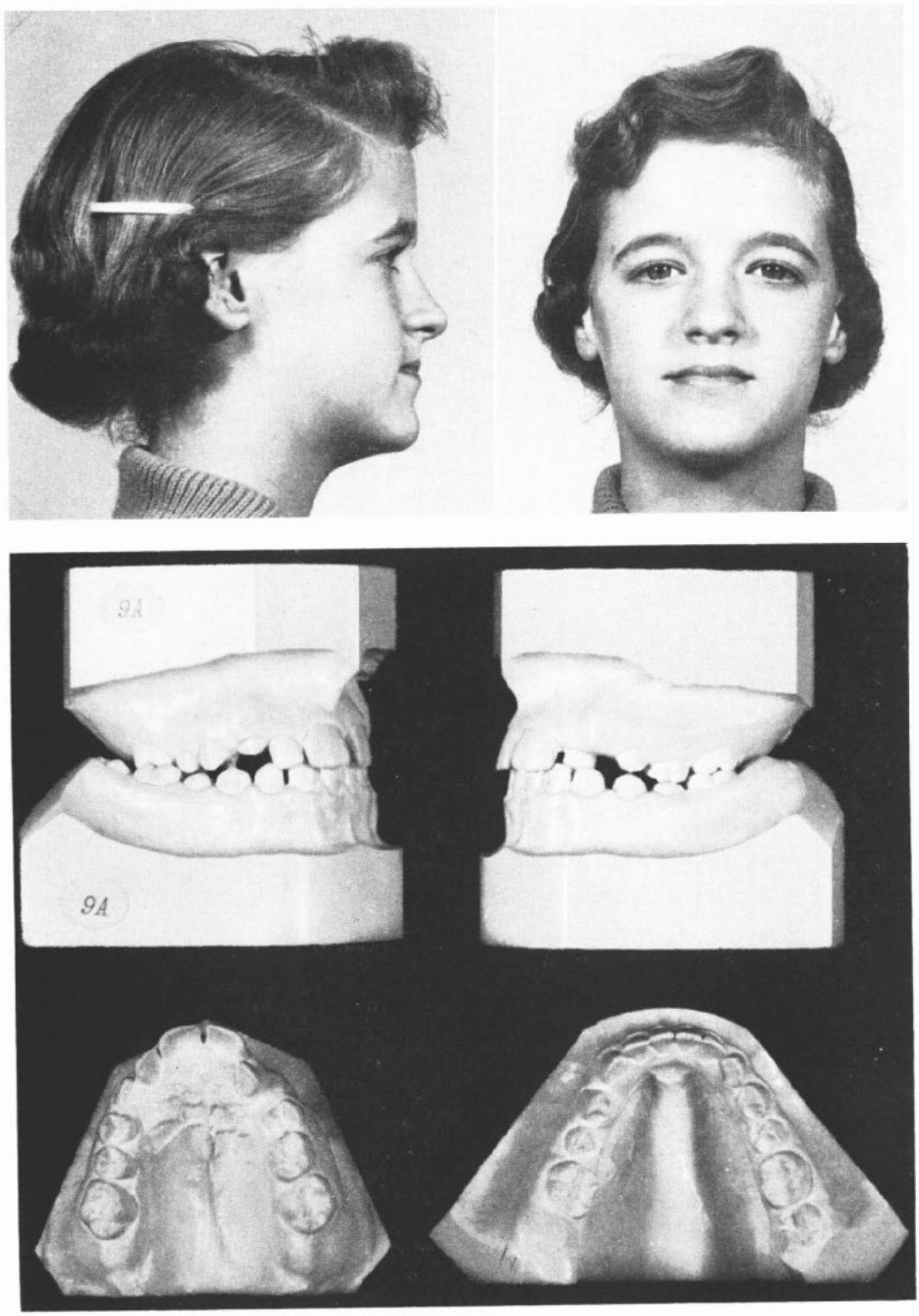
VI. *Full Mouth X-rays*

Third molars — All present, mandibular molars average in size, maxillary molars of smaller comparative size.
Eruption level — Third molars are remote in position, maxillary left second bicuspid is imminent.
Root form — Normal, with all roots closed except second bicuspids.



CASE 9

SNA	81.5°
SNB	82.0°
ANB	—0.5°
$\overline{1}$ to NB	21.0°
Po to NB mm	2.5
$\underline{1}$ to $\overline{1}$	128.0°
Facial Angle	90.0°
$\overline{1}$ to Mand. Plane	—7.0°
FMA	29.5°
FMIA	67.5°



QUESTIONNAIRE

	#1	#2	#3	#4	#5	#6	#7	#8	#9
1. Would you extract in this case?	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
2. If answer is yes:									
a) Which teeth? (fill in)	—|—	—|—	—|—	—|—	—|—	—|—	—|—	—|—	—|—
b) Were the teeth removed because of an arch length inadequacy?									
c) Were the teeth removed to improve facial esthetics?									
d) Were the teeth removed to make treatment easier?									
3. If the answer is no:									
a) Can arch length be corrected during treatment?									
b) Will facial esthetics be satisfactory?									
c) Were the teeth retained to make treatment easier?									
4. Was the headplate instrumental in your decision? Comments:									
5. Does seeing the results of treatment change your original opinion in regard to extraction in this case? Comments:									