Borderline Cases - Part II

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This is a sequel to the previous paper entitled *Borderline Cases*. This presentation consists of posttreatment records of the cases with a report of information from the questionnaire which accompanied the records. These case records were presented at the annual meetings of two orthodontic organizations.

Seventy-seven questionnaires were returned. Many were not completed and you may notice some discrepancies when the results are presented in the paper. It is not our intention to have you draw conclusions from these results but rather to inform you of some of the thinking exhibited by these orthodontists. It was found that many members were extremely surprised that all nine cases were treated without extraction.

There were men who agreed with our thinking that they felt no teeth should be removed after examining the pretreatment records. There were those who would remove teeth to accomplish a result; of those who would, a significant number changed their impression of treatment to conform with our analysis after viewing the posttreatment records.

Of interest is the fact that no one who originally would not remove dental units would do so after viewing our posttreatment records.

It would be ridiculous to assume that everyone should agree with these results. Concepts will and should differ to a reasonable degree. If this effort to refresh orthodontic thought to treating each case as a separate entity has helped the reader to consider important details which may have been forgotten or ignored, we would feel this paper has accomplished its purpose.

The authors approached the selected cases with mixed feelings. Treatment decision was not a simple one. It should be stated that these cases were not selected for what had occurred in treatment but because of the original problem.

One theme is to alert orthodontists to the fact that there is no set of values which can infallibly spell out treatment procedure. We must consider growth potential or possibilities of treatment as well as limitations. An analysis is a four-dimensional projection of the denture in a patient. It is a summation of all the known facts or forces to be utilized for the movement of teeth in the desired direction.

The desired final location of these teeth is predicated upon satisfying esthetics, functional balance, and essential stability following retention procedures. All three requirements are equal and of commensurate importance.

It is necessary to project and visualize treatment procedures, results of active treatment, and the amount of expected postretention stability. Consequently, this exercise projects treatment in terms of time since time is the ultimate judge.

The second records were made at various times after treatment. The full tracings were superposed, as suggested by Steiner, on the nasal floor with the SN lines parallel.

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The first case was a Class II, Division I with an atypical lack of spacing of the maxillary anterior teeth. Both upper and lower arch forms were considered to have adequate arch length. The overjet measured twelve mm while the overbite was eighty per cent.

The skeletal pattern was that of a severe A-B discrepancy with generalized protrusion of the middle third of the face. The lower third of the face appeared to be lacking in vertical height. The FMA was 24.5 degrees.

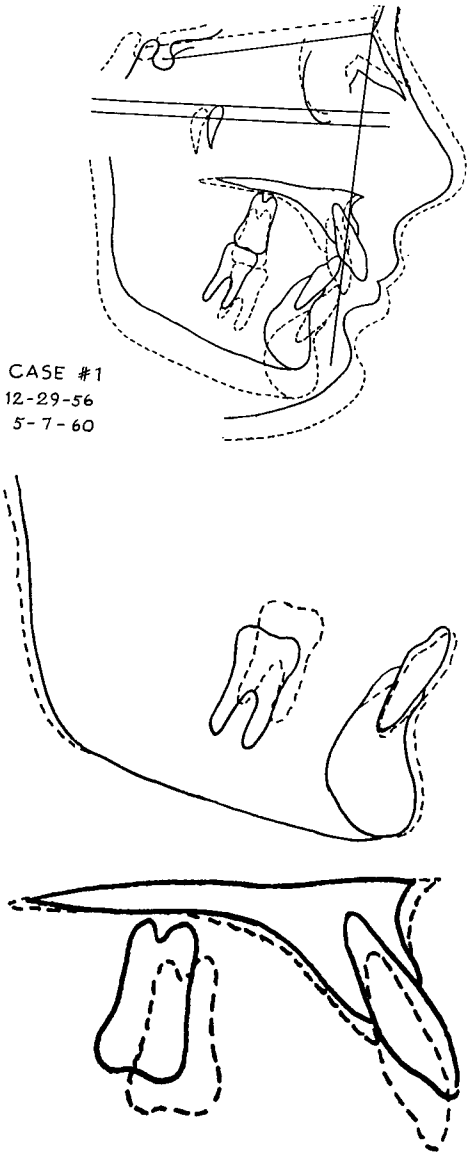
The possibility of extraction was considered, but upon careful analysis with particular regard to the FMA and position of the apices of the lower incisors, a nonextraction course was chartered.

The maxillary teeth were banded from first molar to first molar and a facebow-type headgear was worn for twelve months. The lower right and left sides were banded cuspid through molar. These lower buccal segments were uprighted and tipped back with Class III mechanics. After this the lower incisors were retracted with Class III elastics and vertical loops. At this time the lower second molars were banded. Next an .019 x .026 upper archwire with root levers to the incisors was tied in and Class II elastics were worn continuously until normal occlusal relationship was encountered.

Retention consisted of a tooth positioner worn four hours per day (active wear) plus bedtime for four months. After this period the tooth positioner was worn at night only for six months and then discontinued. The second records were made six months after retention was discontinued.

At the end of active treatment the face appeared to have a more desired balance than before. The lips seemed to have good muscle tone without any appearance of muscle strain.

The cephalometric readings indicate some improvement in the skeletal pattern. The incisors were brought to a more upright position and the overjet was markedly reduced.



SNA	74.0°	$\underline{1}$ to $\overline{1}$	132.0°
SNB	72.0°	Fac. Ang.	84.5°
ANB	2.0°	$\overline{1}$ to Md. Pl.	17.0°
$\overline{1}$ to NB	27.5°	FMA	18.0°
Po to NB	3.5mm	FMIA	55.0°

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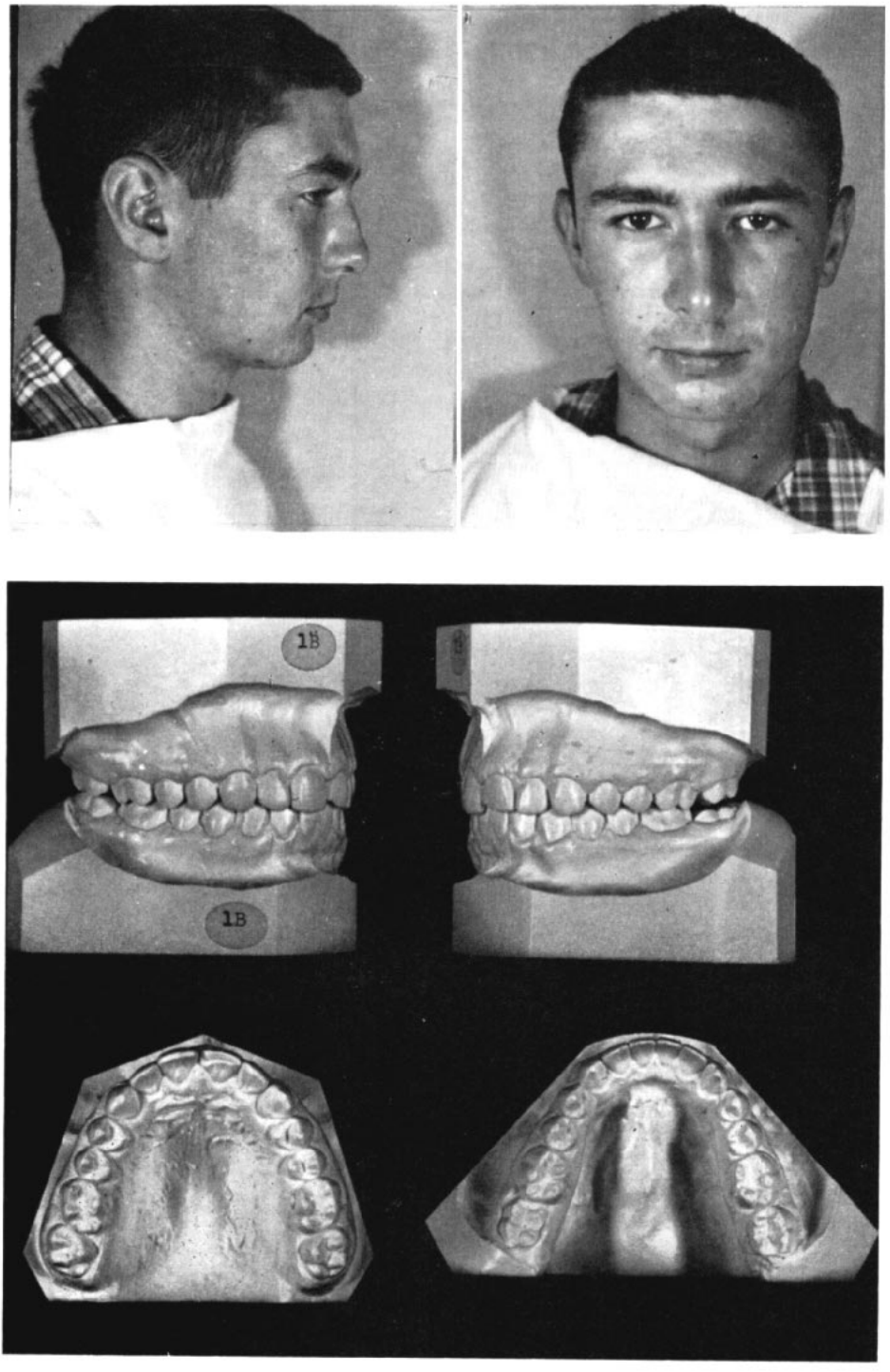

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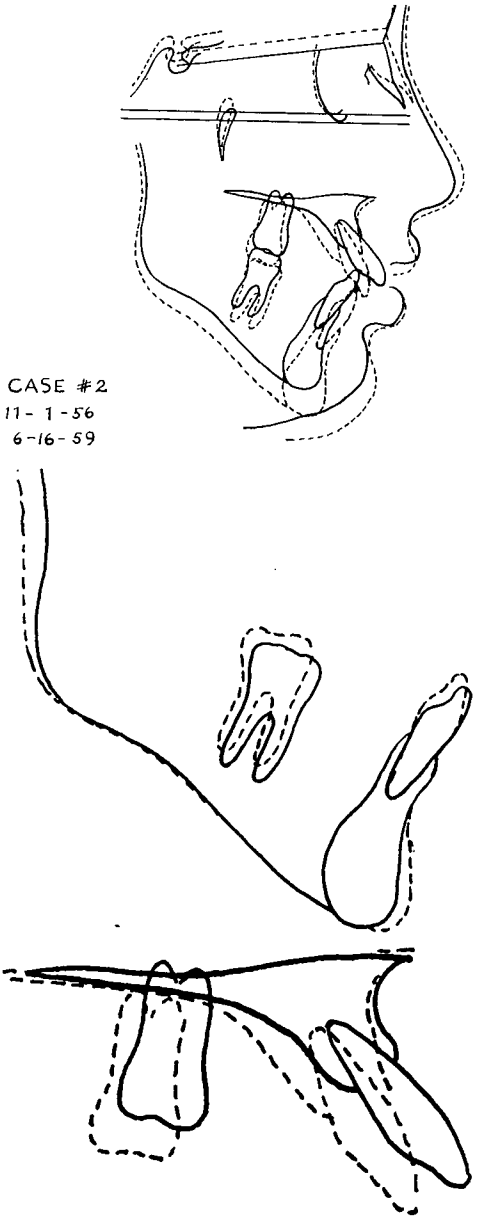
An older brother of Case 2 had been treated without extraction. The growth, cooperation, and final results of the brother encouraged us to attempt treatment of this case in the same manner. The facial pattern was such as to cause doubt concerning the advisability of moving the mandibular anterior segment very much in a lingual direction.

Edgewise appliances were placed in December 1956; a facebow-type headgear was placed acting upon the maxillary first molars; Class III elastics were used when the headgear was worn, a minimum of fourteen hours daily.

Anchorage preparation in the mandibular arch was achieved by use of the headgear and Class III elastics with tipback bends incorporated in the mandibular archwire. This portion of treatment required eight months. In August 1957 an .022 x .028 stainless steel mandibular wire was placed and Class II intermaxillary elastics were worn full time. Cervical traction was continued until December of 1957 when it was modified to a high-pull type of headgear. The Class II elastics were discontinued in November 1957 with the occlusion in full Class III relationship. Further Class III elastics were used when the headgear was worn and only on the right for two months of 1958.

Complete appliance therapy involved eighteen months of treatment with a facebow headgear being used for one year and a high-pull headgear for six months. Class III elastics were used with the headgear for eight months bilaterally and an additional two months unilaterally on the right side. Class II intermaxillary elastics were worn for three months.

The maxillary arch was retained with a flat bite plate, the lower with a soldered cuspid to cuspid. The patient still wears a Hawley retainer occasionally, at night. The soldered lingual will be left in place for five years. A short upper lip and hypertonic mentalis muscle have contributed to a tendency for spacing to recur in the maxillary anterior segment.



SNA	75.5°	$\underline{1}$ to $\overline{1}$	124.0°
SNB	74.0°	Fac. Ang.	82.0°
ANB	1.5°	$\overline{1}$ to Md. Pl.	—8.0°
$\overline{1}$ to NB	22.5°	FMA	40.5°
Po to NB	1.5mm	FMIA	58.0°

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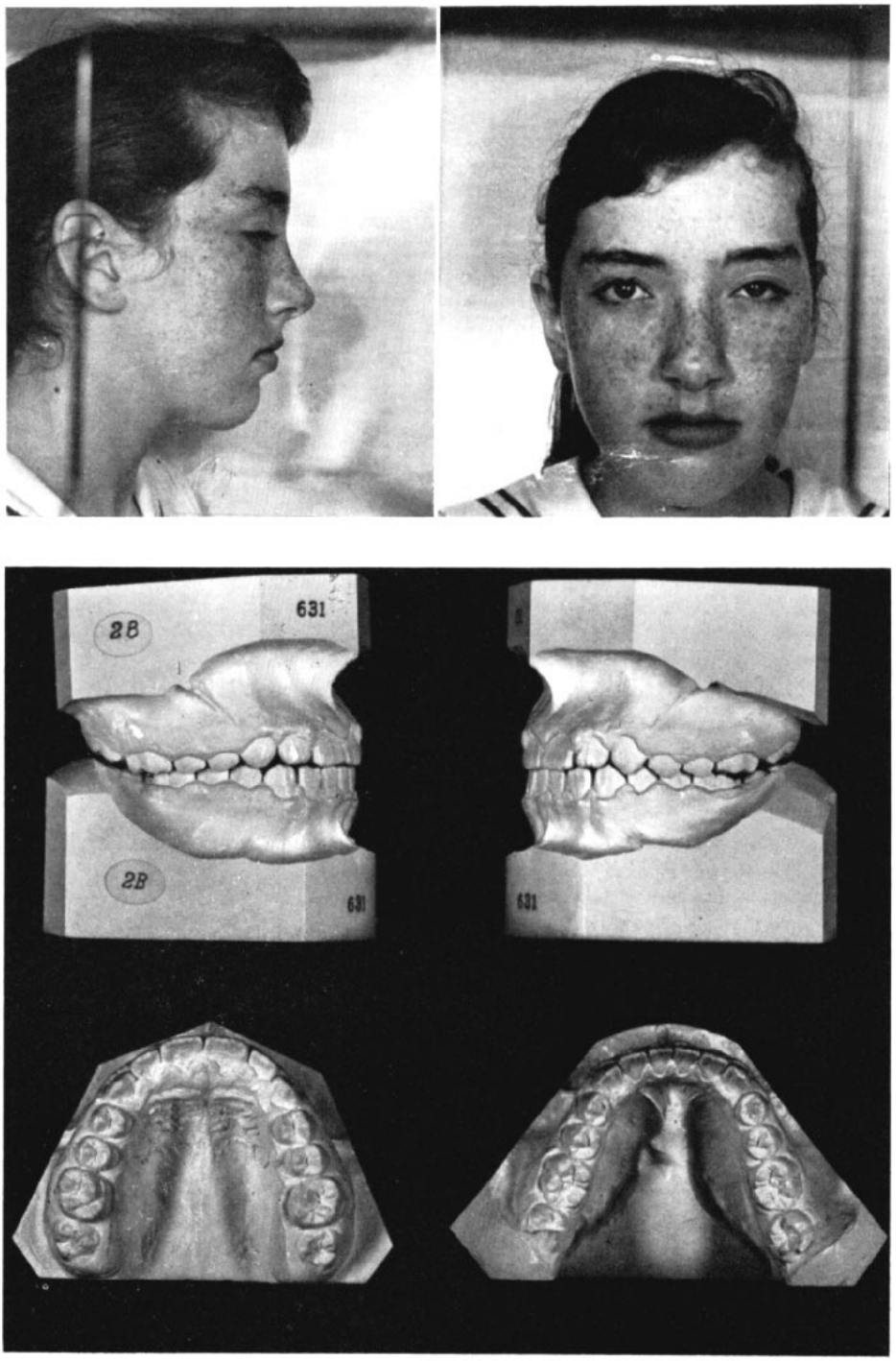

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Treatment of Case 3 was undertaken with the understanding that the removal of four bicuspids might be resorted to at the discretion of the operator. Conflicting interests were weighed with the desirability of a stable result from the standpoint of the arch length problem on one side and the possibility of improvement in lip and lower face contour by retaining all dental units.

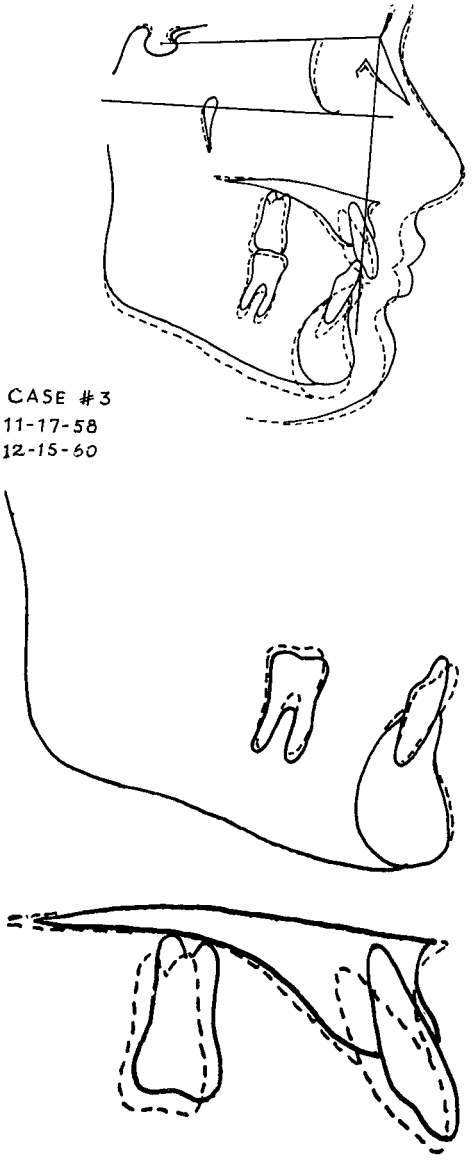
All maxillary teeth except the unerupted left cuspid and the second bicuspid were banded and an .016 steel archwire inserted in December 1958. The lower bands were placed over a period of weeks with the incisors being left unbanded for some time. In February 1959 a facebow-type headgear was placed on an .020 steel archwire and activated against the maxillary first permanent molars. Class III intermaxillary elastics were to be worn when the headgear was worn, fourteen hours daily.

Lower arch length was gained by advancing the arch and using Class III elastics to minimize the forward movement of the incisors. The maxillary left cuspid and the second bicuspid were banded upon eruption. The bite was opened by use of the Class III elastics and a reverse curve of spee in the mandibular arch. An exaggerated curve of spee was used in the maxillary arch.

Class III elastics were used, only when the headgear was worn, for a period of nine months. Treatment time was eighteen months and the headgear was utilized for sixteen months. Class II elastics were never used.

There was no expansion in the molar areas, the cuspid and first bicuspid areas were expanded two to four millimeters.

The maxillary arch was retained with a bite plate. The mandibular arch was retained with a soldered cuspid to cuspid, with extensions lingual to the first bicuspids. The mandibular arch will be retained for a minimum of five years. The patient still wears the maxillary retainer part time. With mandibular retainer in place, occlusion, alignment, and facial esthetics appear satisfactory to date.



SNA	84.0°	$\underline{1}$ to $\overline{1}$	120.0°
SNB	81.0°	Fac. Ang.	88.0°
ANB	3.0°	$\overline{1}$ to Md. Pl.	+11.0°
$\overline{1}$ to NB	30.5°	FMA	23.5°
Po to NB	4.5mm	FMIA	55.5°

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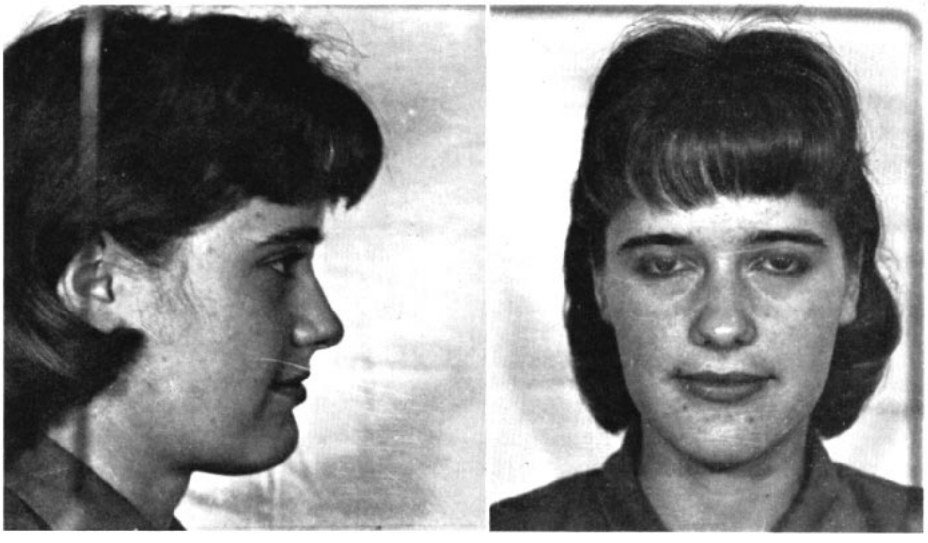

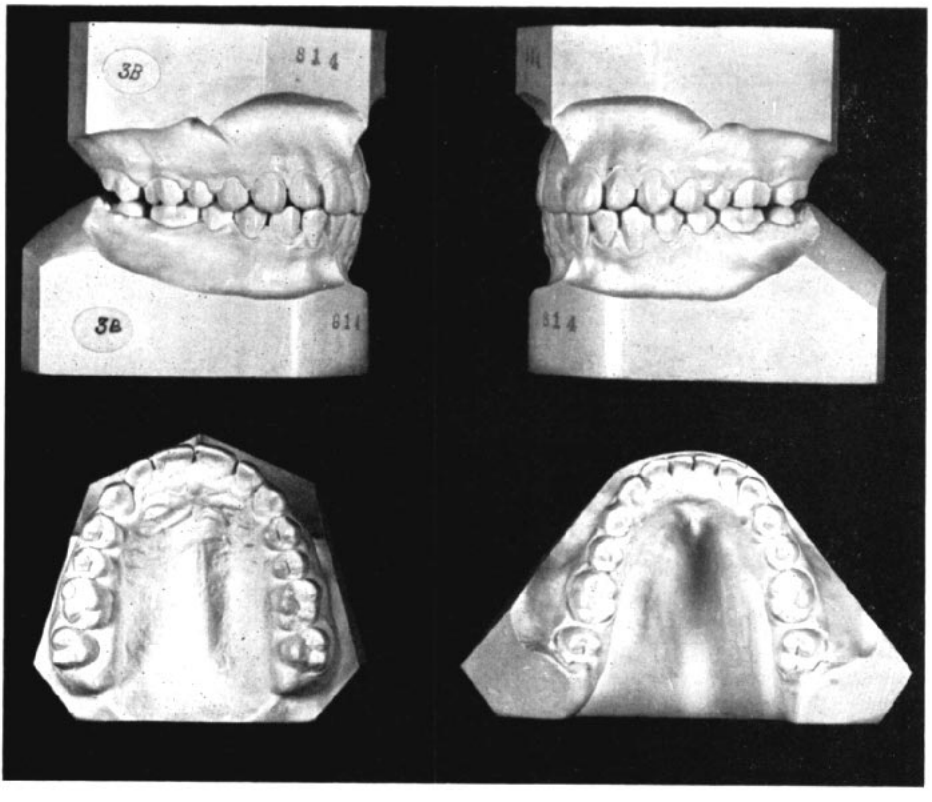

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Case 4, a severe arch length inadequacy with almost complete lack of space for two palatally impacted canines, offered a problem of how to obtain space.

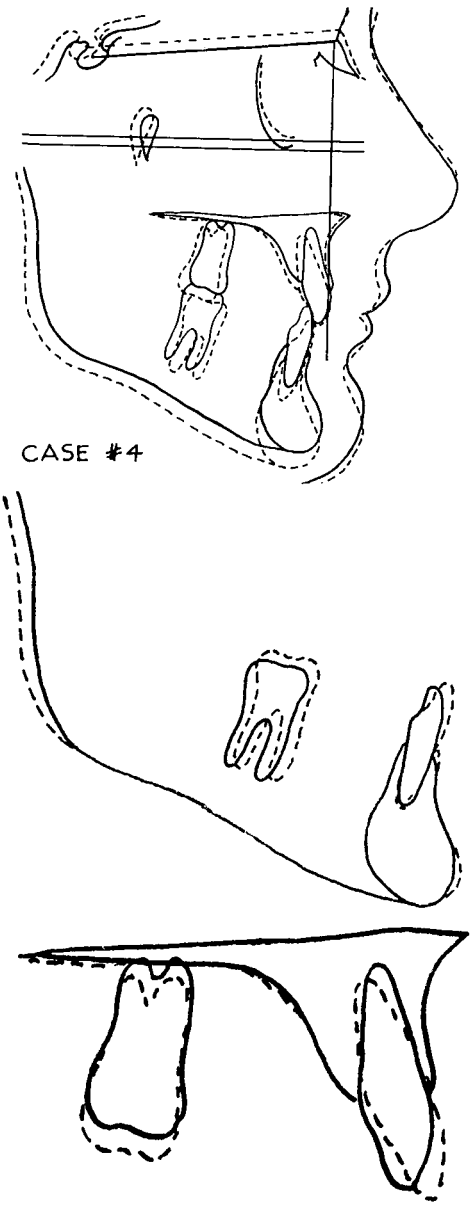
Cephalometric features were a low mandibular plane, retrusion of the mandibular incisors, and a prominent pogonion. The denture bases related at points A and B were in seemingly good balance to each other.

The flat soft tissue profile, the prominent chin pad, and the protrusive incisors led us to believe this case would be best handled if efforts were made to prevent "dishing in" of the face. It was inconceivable that we would gain enough arch length in the maxillary arch without excellent headgear cooperation. It was also inconceivable that extraction would solve the problem without making an undesirable soft tissue relationship worse. Treatment was started to gain arch length by expansion.

An initial maxillary alignment archwire, September 1957, was followed by a .021 x .025 rectangular wire advanced with reciprocal coil springs between the first bicuspids and the lateral incisors. In December 1957, maxillary canines were exposed and banded. In November 1958, lower bands and an archwire were placed. Intermaxillary elastics were worn for two months to improve molar relationship. Bands were removed in April, 1959.

A tooth positioner was worn for four weeks followed by a maxillary palatal retainer. No retainers were placed in the lower arch. The second set of records was made two months after active treatment.

This case posed a treatment dilemma, if extractions were performed, we might add to a facial imbalance. Any flattening of the facial profile, especially in the face of continued growth of the chin, might be very undesirable. On the other hand, expanding the arches created a retention problem. Long retention was considered the choice over extraction.



SNA	83.0°	$\underline{1}$ to $\overline{1}$	147.0°
SNB	80.5°	Fac. Ang.	89.0°
ANB	2.5°	$\overline{1}$ to Md. Pl.	—8.5°
$\overline{1}$ to NB	14.5°	FMA	27.5°
Po to NB	6.5mm	FMIA	71.0°

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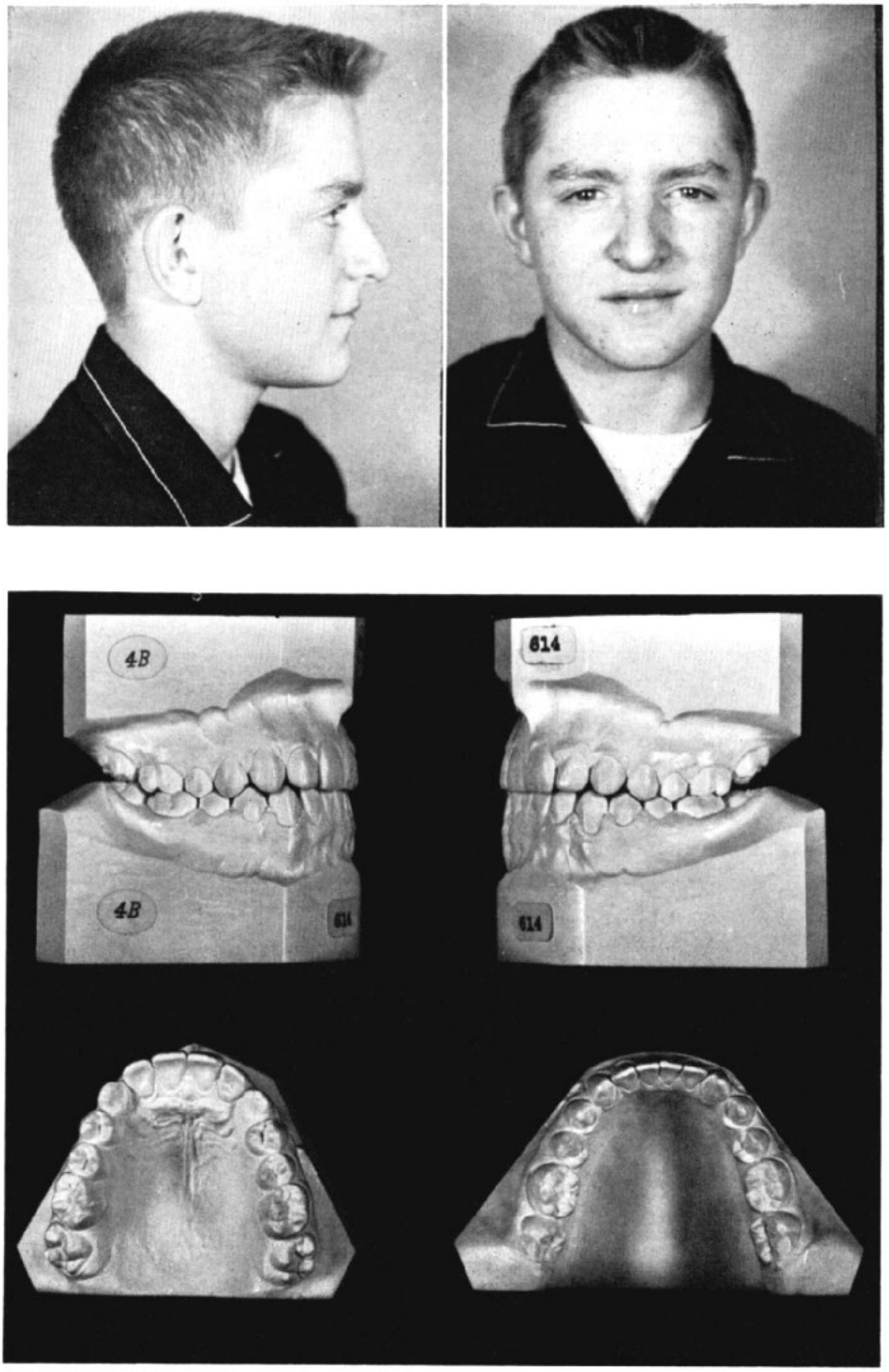

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Although the molars of Case 5 are in Class I, there is a slight Class II tendency in the remaining buccal teeth. The canine relationship is definitely Class II.

There is about six mm inadequacy of arch length in both maxillary and mandibular arches. There is also an excessive curve of spee in the mandibular arch. No third molars were present, as shown on intra-oral radiographs. Cephalometrically, the skeletal readings fell within average norms, but the denture was considered mildly protrusive.

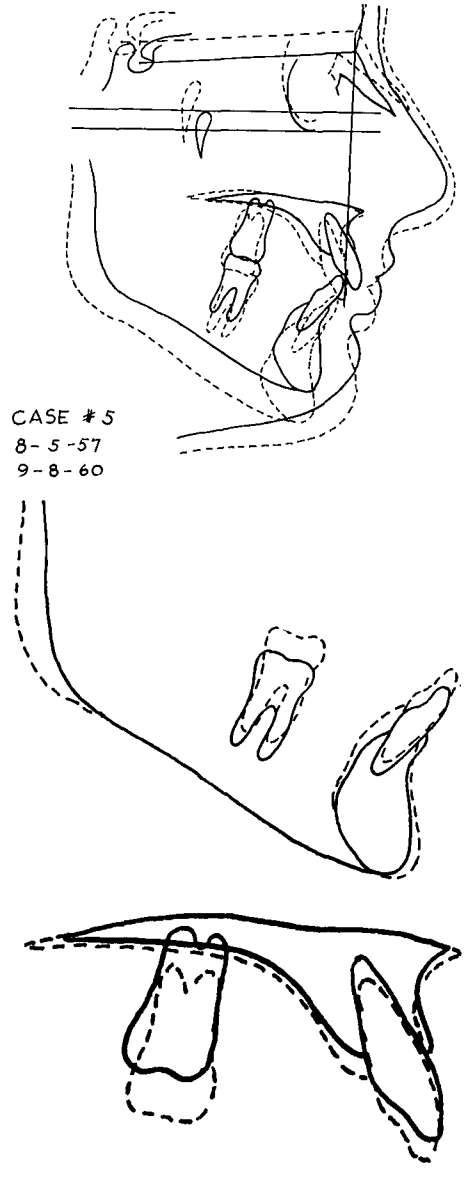
Although somewhat protrusive and inadequate in arch length, it was decided to begin treatment on a non-extraction basis. Occipital anchorage would be used to gain arch length.

Appliances were seated in September, 1957. Initial .018 wires with the appropriate alignment loops were ligated. An occipital headgear was attached to hooks on a .021 x .025 rectangular maxillary archwire.

This archwire was advanced as the headgear was working to move the teeth distally. A second headgear was seated in January, 1958 to be worn as a neck strap, attached to hooks mesial to the lower canines to gain arch length in the mandibular arch. Both maxillary and mandibular headgears were worn a minimum of 14 to 16 hours a day for about eight months. Appliances were removed in December, 1958.

A tooth positioner was worn for three weeks, followed by a palatal plate and a lower cuspid to cuspid.

Arch length was gained by distal forces on both maxillary and mandibular teeth as well as slight expansion of the arches. Dramatic change has occurred in the soft tissue outline. The resultant occlusion has, in our opinion, more than justified this effort and has demonstrated the potential of excellent cooperation in borderline cases. The maxillary retainer was worn full time for one year, and the patient is still wearing it at night. Mandibular retention is still present.



SNA	82.0°	$\underline{1}$ to $\overline{1}$	128.0°
SNB	79.0°	Fac. Ang.	85.0°
ANB	3.0°	$\overline{1}$ to Md. Pl.	+5.0°
$\overline{1}$ to NB	30.5°	FMA	32.0°
Po to NB	3.0mm	FMIA	53.0°

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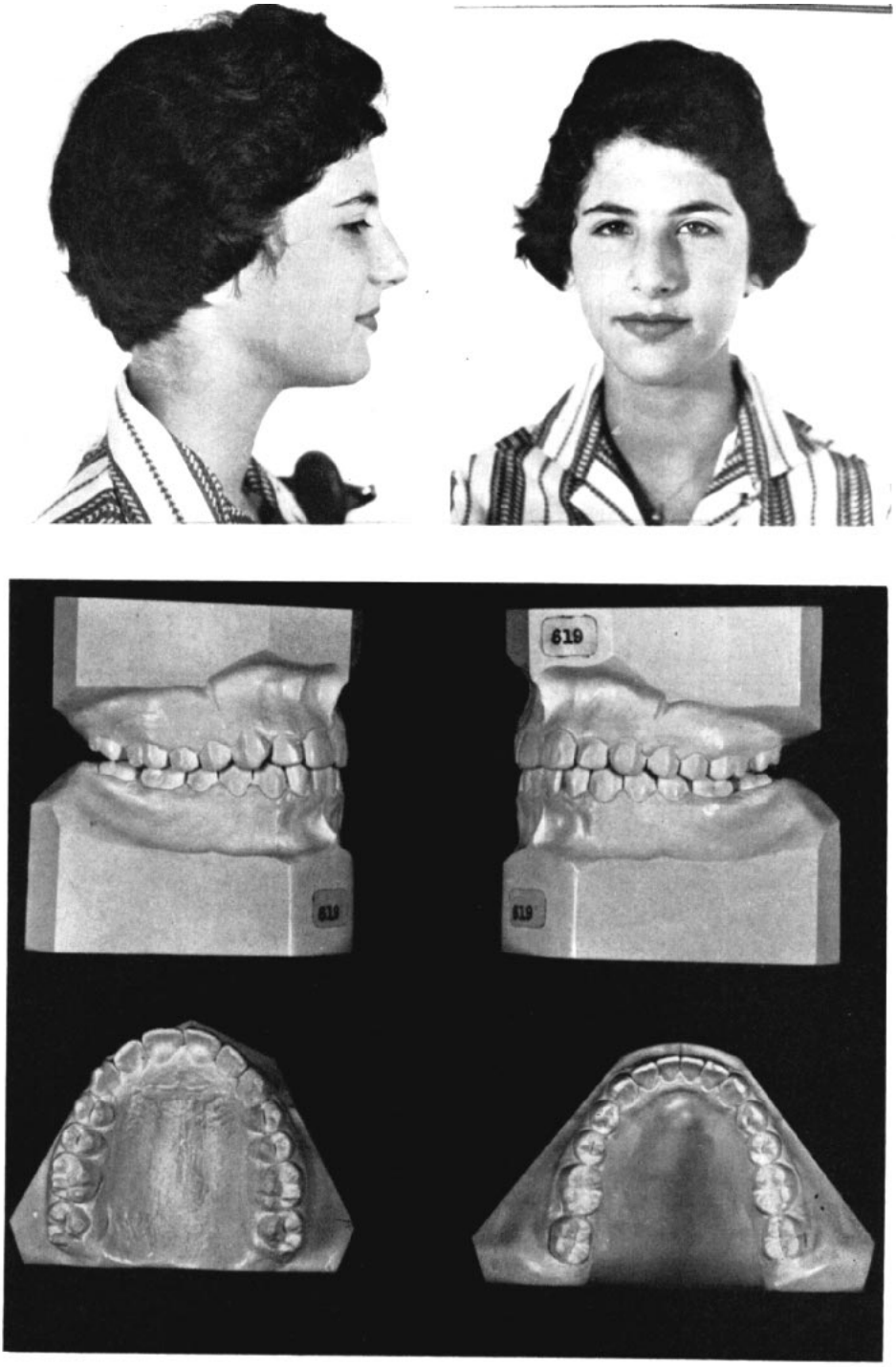

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This case, No. 6 was considered as an anchorage problem because of the great intermaxillary discrepancy and a severe protrusion. The buccal teeth are in a full cusp Class II relationship.

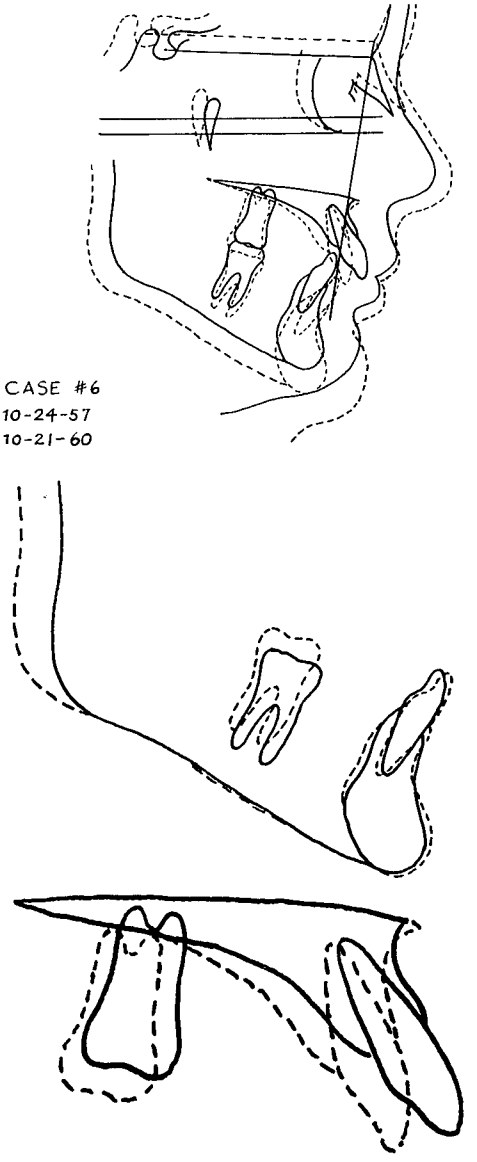
The flat mandibular plane of 32°, plus the prominent pogonion 4 mm anterior to NB plane, allowed us to believe that if anchorage were not taxed in the lower arch, arch length could be gained by moving the lower anteriors forward. This would not bring the measurements out of balance with the skeletal features. If the lower lip were brought away from the lower anterior teeth, it would be stable. This would require that the entire Class II discrepancy be treated by headgear only to the maxillary arch.

Full edgewise appliances were placed February, 1958. Alignment archwires were followed by .021 x .025 rectangular wires. A horizontal pull headgear attached to hooks mesial to upper canines was worn for fourteen hours a day. Therapy was continued in this fashion for six months. At that time a lower arch with horizontal T loops, mesial to lower canines, was placed to open the bite. Mechanics continued until November 1959. At no time were Class II mechanics instituted.

A tooth positioner was worn for five weeks followed by a palatal plate and soldered lower cuspid to cuspid retainer. The palatal plate was worn full time for one year, after which time it was to be worn at night only.

An acceptable occlusion was achieved without the extraction of any teeth. The measurements of the position of the lower incisors in the posttreatment stage are not considered excessive for this type of case, especially in the presence of a prominent pogonion. It is our opinion that had extractions been performed the soft tissue changes would have proven unacceptable, especially with the potential growth for this patient.

This boy is presently under continued retention, wearing the maxillary retainer at night only.



SNA	82.5°	$\underline{1}$ to $\overline{1}$	132.0°
SNB	80.5°	Fac. Ang.	81.5°
ANB	2.0°	$\overline{1}$ to Md. Pl.	90°
$\overline{1}$ to NB	24.5°	FMA	31.0°
Po to NB	6.0mm	FMIA	54.0°

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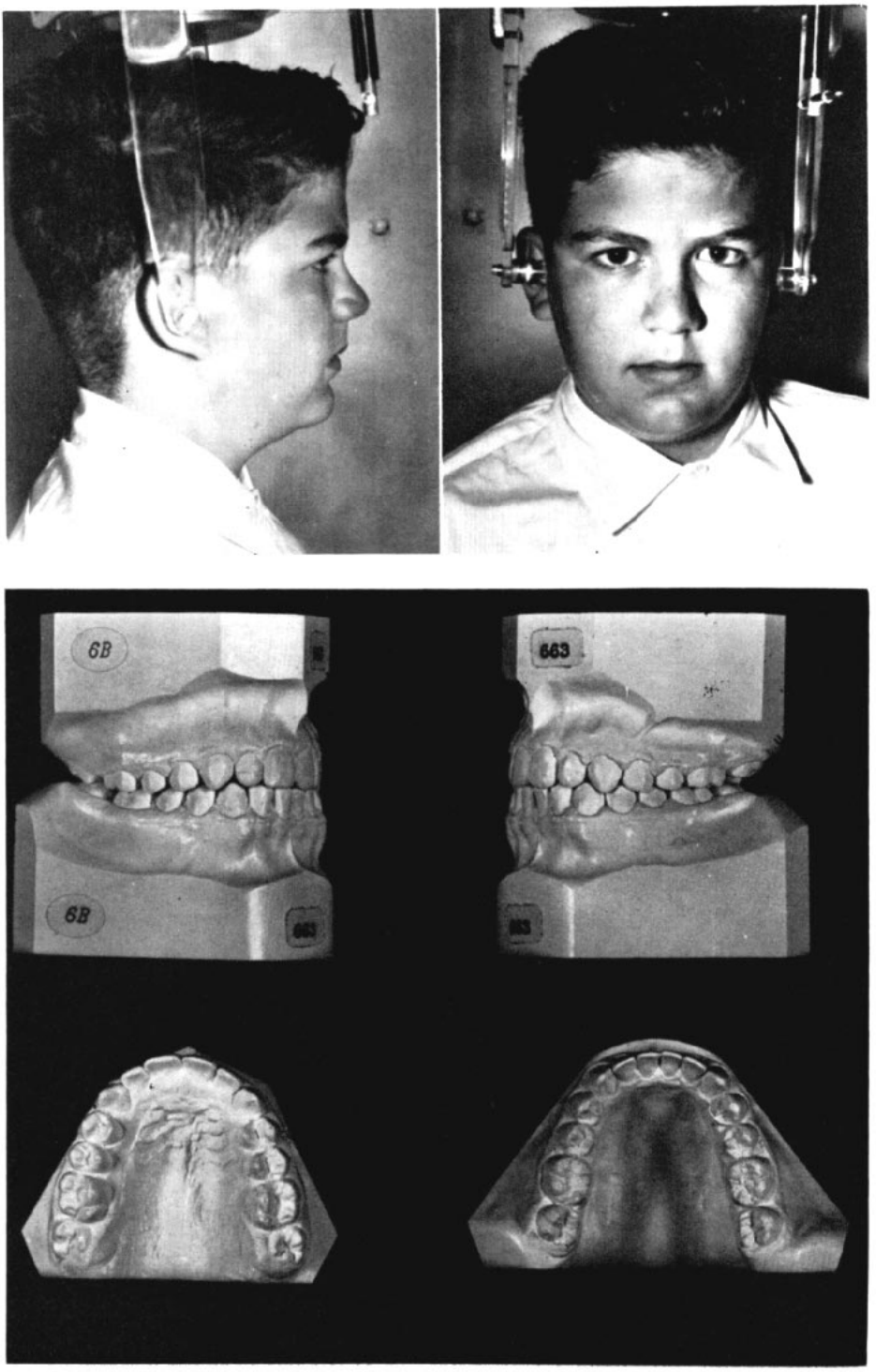

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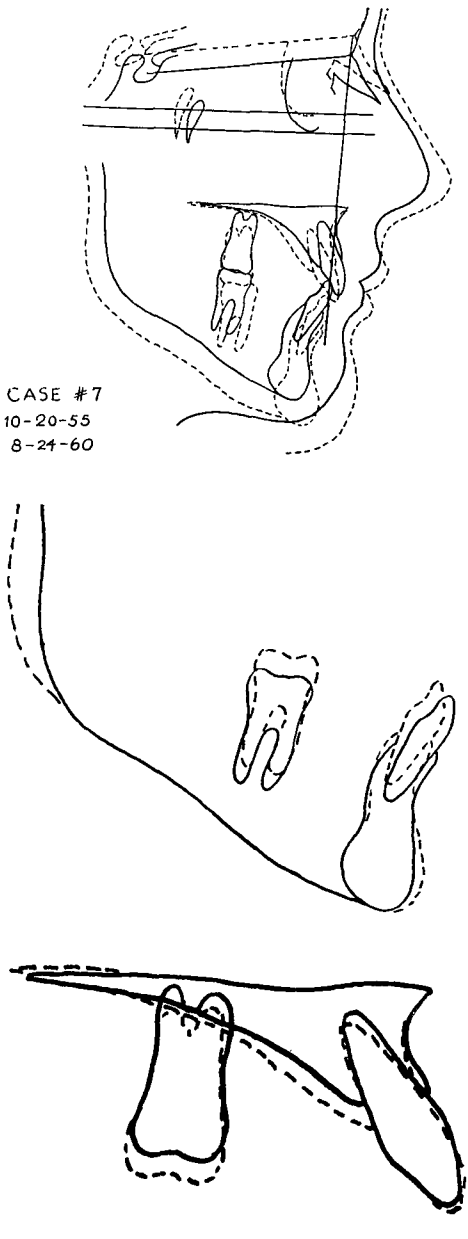
Case 7 was a male, age 13 years, 2 months. His face was very acceptable with no need for improvement. His cephalometric readings fell within normal limits; the skeletal pattern was good with no need for retraction of anterior teeth. Molar occlusion is Class I. An arch length problem is present, especially in the lower; many rotations are present and a lingually positioned lower lateral. Upon closer examination several areas are present with spaces. This may have been the result of deciduous molars being considerably larger than the bicuspids. The problem was whether or not the arch length problem could be corrected without extraction and undesirable facial changes. It also involved the question of denture to supporting structures after treatment. After weighing all factors it was decided to treat the case without removing teeth.

All of the teeth were banded except the upper second molars, upper cuspids, and lower anteriors. Upper and lower leveling wires were used and replaced by .021 x .025 upper and lower archwires. A horizontal pull headgear was attached to the upper arch and worn fifteen hours a day. Class III elastics were worn to the lower arch. Tip-back bends were incorporated in the lower arch; the wire was advanced until there was sufficient room to correct the arch length in the lower anteriors. The lower anterior bands were then cemented, an .016 lower wire placed, followed by an .018. The upper cuspids were banded and an .016 archwire placed. Ideal finishing arches were then placed and Class II elastics worn for one month. Treatment time was twenty months.

Upper and lower acrylic retainers were placed. Final models were made six months after the active appliances were removed.

Finished photographs and cephalometric records reveal that the original goals have been realized. Three years after treatment the case is holding well.



SNA	78.0°	$\underline{1}$ to $\overline{1}$	135.5°
SNB	77.0°	Fac. Ang.	86.5°
ANB	1.0°	$\overline{1}$ to Md. Pl.	—11.0°
$\overline{1}$ to NB	15.5°	FMA	33.0°
Po to NB	5.0mm	FMIA	68.0°

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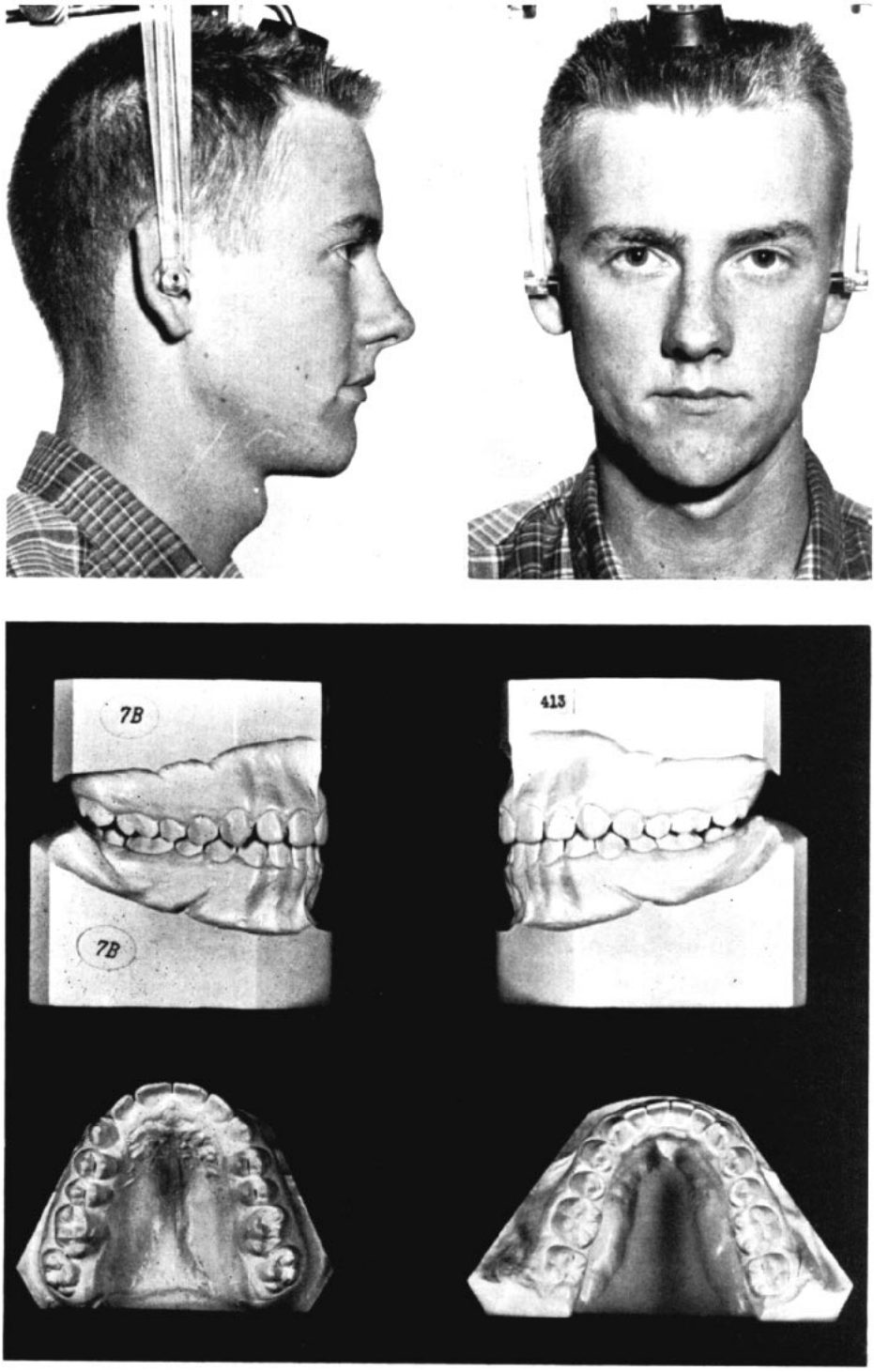

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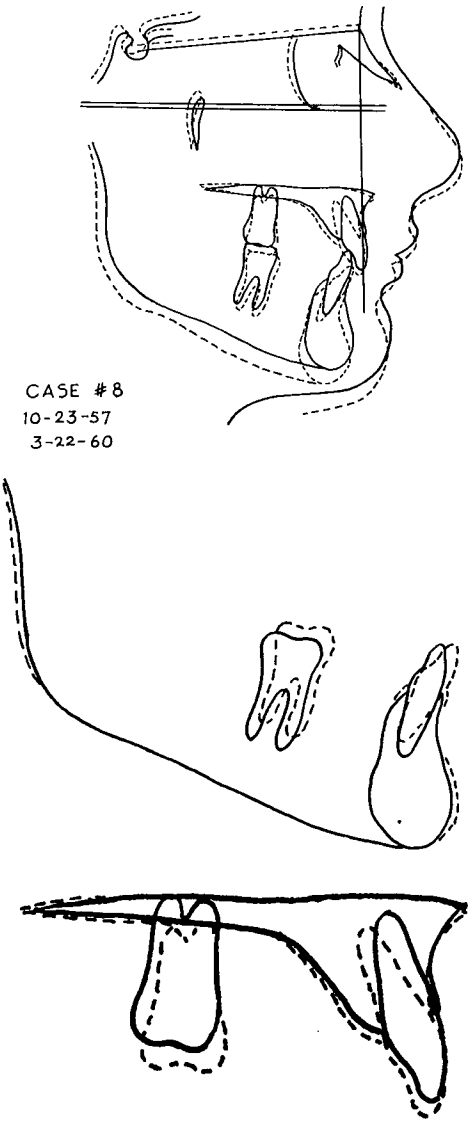
Case 8, a girl age 12 years and 1 month, had a nicely balanced face before treatment. Her cephalometric readings revealed a good skeletal pattern with good denture readings except the anterior teeth were too upright. The original models showed Class I molar relationships with upper anterior teeth that resemble those found in Class II, Division 2. An excessive overbite was present with upright upper and lower incisors. A slight arch length problem was present in both upper and lower anterior segments. The lower right second bicuspid was impacted with very little available space. The problem resolved itself into a question of whether space could be gained for the impacted bicuspid and the anterior rotations without removing teeth. It was decided to treat the case without extraction.

All teeth were banded at the start of treatment except the upper second molars. An .014 lower archwire and an .016 upper wire were placed. The lower was replaced by an .020 wire with a push coil between the lower first bicuspid and first molar. After space was gained the bicuspid quickly erupted and was banded. Upper and lower .020 wires were placed at this time. No headgear was worn and edgewise wires were not employed in any phase of the treatment.

After fifteen months of appliance therapy a tooth positioner was worn for two months. An upper acrylic and lower cuspid to cuspid retainers were then placed.

The cephalometric records made after five months of retention reveal the activity of the tooth positioner in improving the axial inclinations of the anterior teeth. The crowns of the lower anteriors were tipped forward during active treatment but, due to the positioner set-up, the roots were moved lingually. Favorable facial growth occurred during treatment. Finished photographs reveal a very pleasing face. With the thickness of bone in the lower anterior region and the prominent bony chin, it is hoped and felt that the case will remain stable.



SNA	85.0°	$\underline{1}$ to $\overline{1}$	127.5°
SNB	81.0°	$\overline{\text{Fac. Ang.}}$	88.5°
ANB	4.0°	$\overline{1}$ to Md. Pl.	6.0°
$\overline{1}$ to NB	28.5°	FMA	26.0°
Po to NB	4.5mm	FMIA	58.0°

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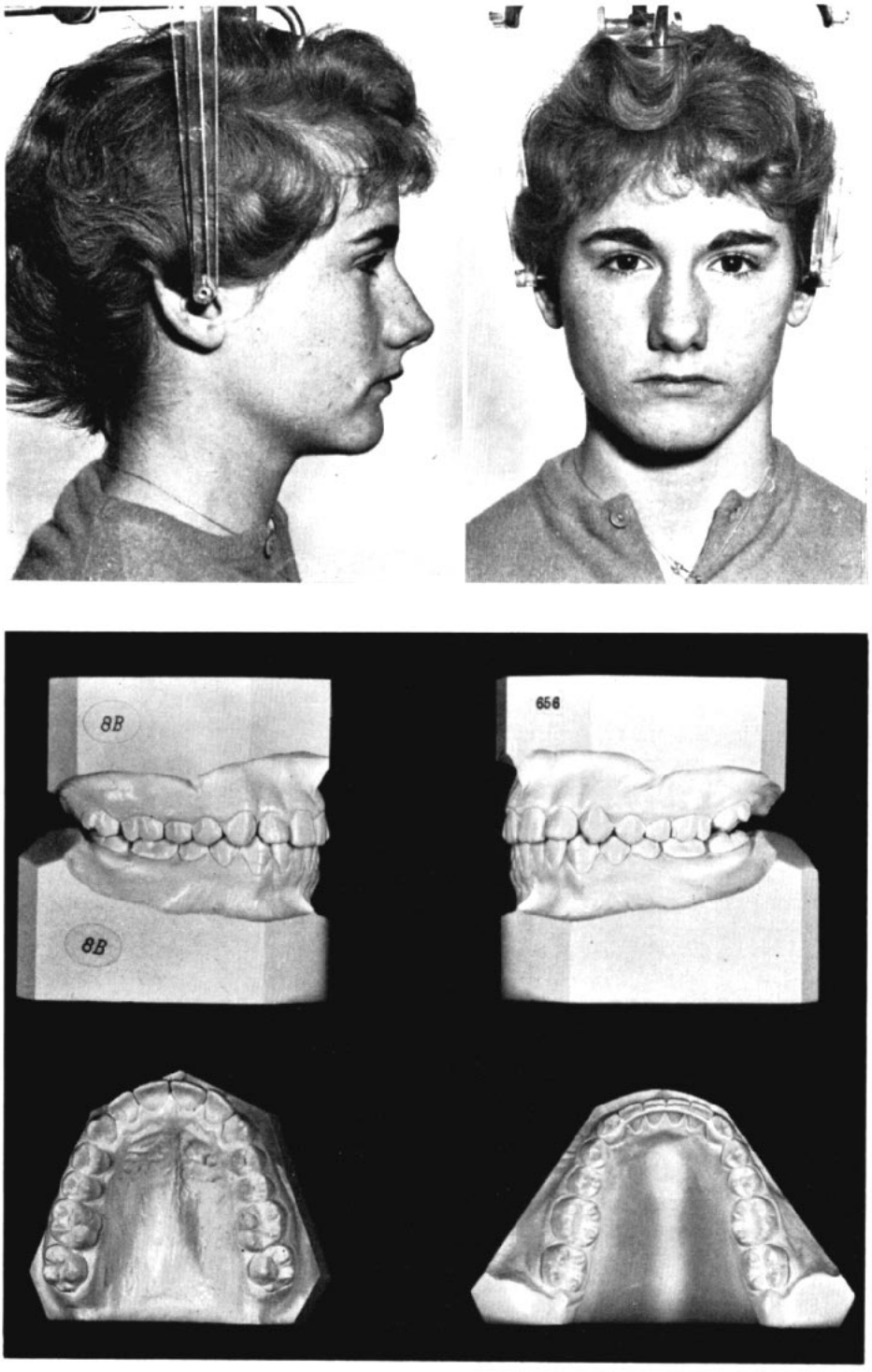

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Cephalometric data of Case 9 indicated a skeletal relation within a limited range or normal, but decidedly towards the Class III direction, attributable to both the maxilla and the position of the mandible. Since the photographs and clinical examination revealed a relatively thin lip contour and a pronounced soft tissue outline of the chin, it was felt that the teeth should not be repositioned in a posterior direction. Another factor observed was the small amount of arch length needed.

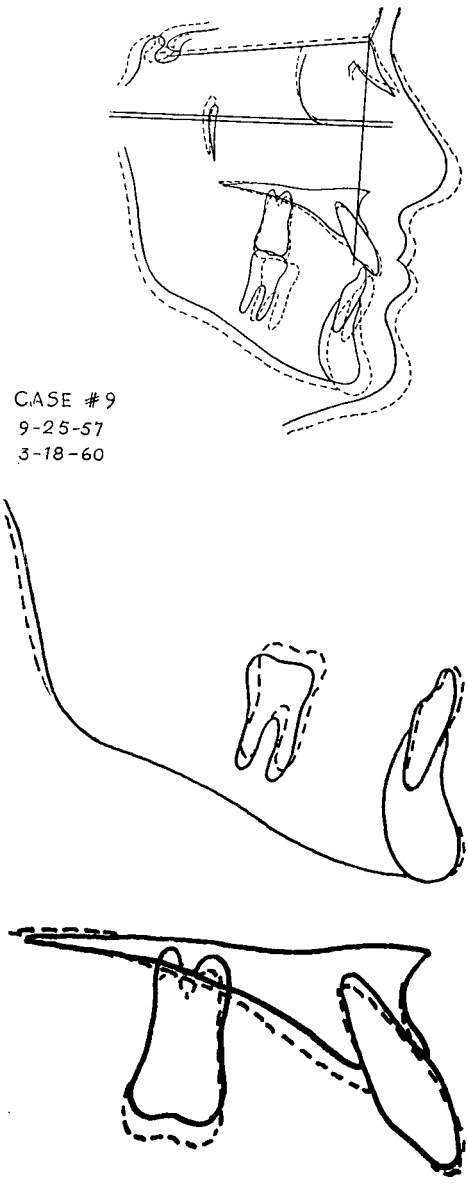
In my opinion the above factors contraindicated the need of extraction for this case. One unknown factor was the amount of growth to be expected; the age and cephalometric data indicated this might be a problem and that overbite would likely be at a minimum. Considering all factors, a decision was made to treat the case without extractions.

All teeth were banded. Initial efforts were directed to correct the maxillary buccal crossbite by expansion. Successive round archwires were utilized. After sufficient arch space was obtained, the inlocked lateral was moved into alignment; simultaneously, the lower arch was having limited constrictive forces brought to bear upon it to counter maxillary expansion. Edgewise .021 x .025 wires were then placed to promote three dimensional positioning of all teeth and control for the final movements.

During the last two months of treatment Class III elastics were worn.

The case was retained with a Hawley retainer for the maxillary arch and a soldered lower cuspid to cuspid.

This case presented no unusual problems. At the present time it has been in retention for approximately twenty-six months. The patient has not been too faithful in wearing her upper retainer. In spite of this the case is holding well. Overbite has decreased only a fraction. Her instruction at the present time is to wear the retainer alternate nights.



SNA	81.5°	$\underline{1}$ to 1	126.0°
SNB	83.5°	Fac. Ang.	92.5°
ANB	—2.0°	$\overline{1}$ to Md. Pl.	—4.5°
$\overline{1}$ to NB	22.0°	FMA	26.0°
Po to NB	4.0mm	FMIA	68.5°

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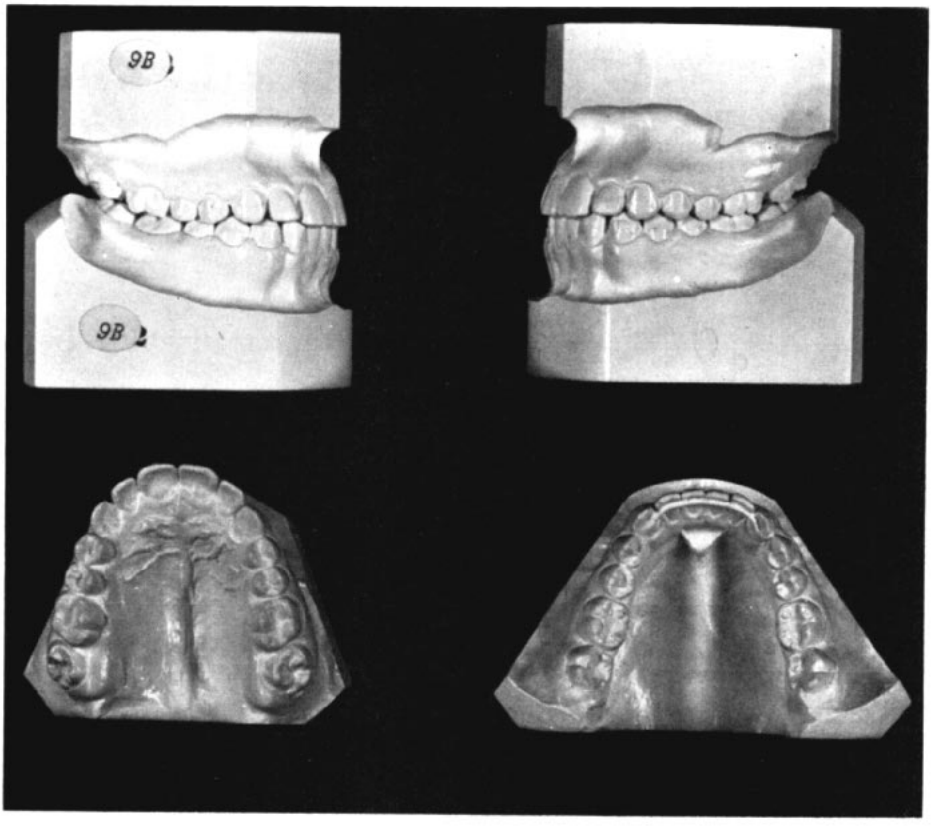

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Discussion

In addition to the responses to our questionnaire we received many comments. The scope of the comments included such things as facial appearance, treatment procedures, results of treatment, growth, and stability.

Pleasing facial appearance is not easily evaluated. As a result of this difficulty in evaluation there is a great divergence of opinion as to what is excellent facial balance. Perhaps there may be some slight narrowing of this broadly defined, esthetic standard in the future, but most likely there will always be some difference of opinion to allow for man's ability to think independently.

Many comments were directed toward treatment procedures and results of treatment. Of these comments the manner in which these cases were treated was of interest; there appeared to be a general agreement that the occlusal details and interarch relations were very good.

As to growth, a composite of a number of comments would be "without growth this case would have failed". We agree with this comment and wish to add, "Wouldn't it have been more of a failure if we had removed teeth and it had grown the way it had?". Naturally, the all important question is when and where we can expect to get growth. There have been published some excellent papers on growth prediction. Sometime in the future we may be able to more accurately predict the time and location of growth; but for the present we should consider every possibility and probability.

The most often heard criticism of these cases concerns itself with their ultimate stability. There is little to say concerning the question of stability. This criticism can be answered more easily at a later date when we can present a paper showing the postretention results.

To facilitate the reporting of the results of the questionnaire two tables have been prepared.

Table I has been constructed to report how the orthodontists answering the questionnaire felt about the extrac-

TABLE I

Case	1	2	3	4	5	6	7	8	9
Extraction	37	43	44	18	30	19	24	20	4
Non-extraction	16	6	7	34	10	31	28	30	48

TABLE II

Case	1	2	3	4	5	6	7	8	9
Extraction	37	43	44	18	30	19	24	20	4
Opinion									
Changed to Non-extraction	20	8	10	8	24	2	9	8	2

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tion or nonextraction of teeth in these cases.

Table II is designed to demonstrate how the group that originally preferred extraction reacted to the posttreatment records.

From the tables it can readily be seen that there was little uniformity of opinion concerning extractions. The variation of response between the individual cases is in part due to the lack of similarity of the malocclusions. It is interesting to note that in some of the cases there was a decided change in opinion after seeing the posttreatment results.

Table I shows that in four cases out of nine a majority of the orthodontists would extract teeth after examining the pretreatment records. After inspection of posttreatment records a majority of them would extract in only two out of nine cases.

A complete study of each case, before and after treatment, can be made by referring back to the records and coordinating them with the submitted tables.

Conclusions

1. The authors find many considerations are necessary to decide on a borderline case. No single diagnostic criterion can be relied upon.
2. It is imperative that all growth potential be carefully considered.

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