Diagnosis in Orthodontics*

C. W. Carey, D.D.S.
Palo Alto, California

In making a diagnosis a careful appraisal should be made of all the factors available concerning the case at hand: the patient, history and hereditary background; casts, photographs, dental X-rays, and cephalometric X-rays, if available.

It should first be decided when examining the patient if treatment is necessary: is it possible by orthodontic means to obtain sufficient permanent improvement to justify the time, effort and expense to be borne by the patient? Many Class I cases with slight irregularities and minor occlusal relation deviations will fall into this classification. If malocclusion exists, is it the correct time to begin orthodontic interference? Here we may encounter a great variance of opinion, not only in expressed opinions of contemporary colleagues, but also in the literature, the college program, and in the textbooks.

Our own experience is the best guide, but to gain this knowledge from experience entails making many mistakes in the trial and error method of arriving at a conclusion. Being one who has made many mistakes in judgment and having learned the hard way, I have reached the conclusion that the whole question of diagnosis does not have to be a hit-or-miss proposition, but can be reduced to a rational basis.

Experience would not be so important if we had a comprehensive knowledge of the growth and development of the jaws, teeth and related structures. Here is where we fall down because of the incomplete information on this subject. Diagnostic opinions vary with the interpretations of the scientific material presented; however, we are making progress and the cephalometer has had an important place in advancement in this field. If we are willing to study objectively the clinical work that has been done, we will be able to reach important conclusions regarding the limitations in treatment and certain factors in the growth and development of the jaws which may be substantiated by scientific hypotheses which appeal to us in confirmation of our own clinical deductions.

In forming opinions based on clinical material, it is important that we use material that is not fictitious. By that, I mean that a case cannot be judged as a completed clinical result until after it has reverted to a passive state, which will occur several years after all retaining devices have been discarded. Models of cases after treatment and initial cuspal settling and before final settling are interesting but not conclusive of anything except, possibly, skillful mechanical dexterity. The prognosis of their stability, however, may be fairly accurately determined by again referring to and comparing with work done on similar cases which have stood the test of time.

A ready source of information on the question of stability of the orthodontic result may be obtained from college living groups. In many sororities, a substantial majority of the membership

* Presented at the University of Washington, June 26, 1950, in a postgraduate course in orthodontics.

have had orthodontic treatment. It is an embarrassing fact that a large proportion of those treated have little to show for it. The diagnosis must consider the potentialities of the dentition to respond to a treatment plan for a balanced, anatomic, aesthetic, and stable result.

When the patient reports for examination and it is apparent that a malocclusion exists which would benefit from treatment, it is advisable to make another appointment for study models. From these models, if treatment is to be deferred, much may be learned by subsequent studies when the patient returns. The consultation should include an appraisal of the patient's head, face, stature, and parentage. Habits affecting the dentition can usually be detected at this time and questions directed concerning them. Following this, a general description of the condition is given to the parents together with the possibilities of correction by orthodontic means. Then follows orthodontic education of the parent and child to familiarize them with the importance of the correction, and the meticulous care they must exercise, and the diligent cooperation expected of them. If the patient does not want treatment, the parents should wait until he does; otherwise treatment will only result in failure.

If it is a mixed or deciduous dentition, it must be decided then and there if it is possible to achieve justifiable benefits from treatment at this time. In my opinion, orthodontic correction in deciduous dentition should be limited to Class III cases, begun after the age of two years. In mixed dentition, treatment should be confined to the following:

a. Anterior cross-bites as soon as incisors have erupted to contact.

b. Posterior cross-bites, unilateral and bilateral, (they are usually maxillary contractions; unilateral maxillary contraction is extremely rare).

c. Simple pre-maxillary protrusions induced by habit, such as thumb-sucking, lip biting and tongue thrusting, and the open-bite resulting from the latter.

d. Irregularities of the upper anterior region, where space permits.

e. Maxillary protraction cases in which there is adequate supporting bone area in both jaws, or a discrepancy not to exceed 2.5 mm. in linear dimension.

f. Class I cases in which there is a forward displacement of the lower jaw — not to be confused with Class III malocclusion.

g. True Class III cases, with the understanding that treatment is only a poor compromise, effected by carrying the upper anterior teeth and alveolar process forward beyond the proper anatomic location in the skull, and that the lower jaw may continue to grow forward until the age of twenty, making correction impossible except by surgical resection of the mandibular ramus.

h. Simple space maintenance after early loss of teeth from accident or disease, where bone area is adequate.

Mixed dentition treatment is contra-indicated in cases.

a. Where a discrepancy of tooth to supporting bone greater than 2.5 mm. in linear dimension exists. These cases are treated most advantageously at the last stage of transition before eruption of the cuspids.

b. In deep-bite cases, Class I, Class II, and Class II, division 2.

c. In general, in any case where the patient can be more adequately cared for in the secondary dentition. In any case treated in the mixed dentition which requires secondary treatment, the patient is under care for approximately five years. Good cooperation can be expected for approximately 18 months, and few

cases are prolonged beyond this period without some evidence of enamel destruction. The patient should be treated at the time when the least amount of mechanical therapy is required to produce the desired result.

The employment of Class II anchorage in any mixed dentition will only serve to increase the deformity and to create a more difficult problem for the secondary treatment. If the maxillary protraction cannot be reduced with occipital anchorage, it is advisable to wait for the eruption of the permanent dentition.

Dr. Bercu Fischer of New York believes that by treating Class II, division 1 cases of deep-bite with occipital anchorage and bite-blocks, a gradual alignment takes places in the lower anterior region, which results from the release of lateral pressure from opposing teeth, and that extraction of bicuspids can thus be avoided in secondary treatment. I hope he is right, because it does seem to be medically incorrect to look at an abnormality and tell those concerned, "Yes, he has it, but we don't want to do anything about it for three years."

Yet, thus far, with what we know and have been able to do about it, it has been generally a waste of time, effort and money to interfere with these cases until after eruption of the bicuspids. I have never seen a closed bite permanently improved until these teeth have erupted; and unless this condition is corrected, very small benefit will accrue from the treatment. I have observed that men who treat all of these mixed dentition Class II cases seem to continue to do so in spite of the long drawn-out and weary procedure for all parties concerned. The parents are unhappy in many instances and may consult other orthodontists, but they are so involved that they feel they must go on and no one wants to interfere or dissuade them, unless it is a case of gross negligence on the orthodontist's part or of the parents' complete discouragement with the treatment.

In the usual established orthodontic practice, these mixed dentition cases represent three-fourths of the consultations. If we were to accept all of them for treatment, it would take four associate orthodontists to take care of the practice; but it would not be many years before the disappointed customers had multiplied so rapidly that there would be very few secondary dentition cases reporting, and one man could handle the practice. People soon begin to notice that their children's playmates are getting in and out of bands within a few semesters at school, and they can see the results. The parents who would not wait for you to start treatment might have helped you pay the gas bill in your first years of practice, but they will be your strongest boosters several years later, because they will realize eventually that you knew your limitations and would not take advantage of their unwitting willingness to get started with treatment. By not accepting for treatment these cases at a time when our present-day treatment methods are ineffective, we are building our practices upon a high percentage of success with reasonable technical skill and judgment, and it will not be long before the satisfied patients are referring more cases to our office than we can take care of adequately.

If the case is a secondary dentition or in the last phase of the mixed or pirmary stage and correction is indicated, impressions, photographs and history are taken and preparations are made for treatment, and an appointment is made several weeks later for the diagnosis. This gives us time to study the X-rays, the models and photographs. Previous to the diagnosis

appointment, the mesial distal diameters of the lower and upper anterior teeth are measured on the casts and recorded on the graph paper. From this graph the arch form is outlined and the required linear arch dimension recorded. For this we use the L. A. + 2x formula. Then measurement is taken of the available linear arch dimension by adapting the .020 brass wire on the cast from the mesial of the left lower first molar, over the bicuspid teeth through where their greatest diameters around and over the anterior ridge, where the incisal edges of these teeth should be located for their most favorable anatomic and aesthetic position, and ending at the mesial marginal ridge of the lower right first molar. A piece of soft utility-wax is used on the left side to help in keeping the wire in position. The arch-form of the wire should be symmetrical. It is then cut off and measured. This measurement is compared with the recorded measurement of the required linear arch dimension. If it is shorter by less than 2.5 mm. or longer than the former, the case will be treated without extraction. In this event, we will delay treatment until complete eruption of the maxillary cuspid, so that full mechanical advantage can be obtained in maxillary anchorage. 2.5 mm. is the borderline. The decision to extract or not to extract is made by studying the position of the third molars, width of the mouth, flexibility of the labial tissues, and the facial type of the individual.

If the discrepancy is more than 2.5 mm. but less than 5 mm., consideration will be given to extraction of the second bicuspids. Here we must study the condition of the teeth to be sacrificed and their anatomy. Also, the discrepancy may be greater in the lower arch than in the upper. The second bicuspids are removed in the arch with the least discrepancy. If there is a difference in mesiodistal diameter of the bicuspids, it must be planned so that the remaining teeth may be placed in functional relation without spacing. The upper first bicuspid has a longer and slightly larger crown and its presence will render a more pleasing appearance in the dental arch than the second bicuspid, whereas the lower first bicuspid is a poorer anatomic specimen than the lower second. Thus, it is frequently desirable to remove the upper second and lower first bicuspids. When the discrepancy is 5 mm. or more, it will be necessary to remove the first bicuspids, because we will need at least 2.5 mm. distal root movement of the cuspids. In these cases, all the posterior anchorage at our command will be needed to position the anterior teeth on the ridges in their most desirable positions.

We should not ignore the possibility of removal of the first molars if they are of poor structure. Matching the extraction of lower first molars and upper second bicuspids will be the correct solution in some cases.

In the borderline cases of 2.5 mm. discrepancy in patients of fourteen years or older, the second molars may be removed if they are of poor structure, or the third molars, before treatment begins.

A good aesthetic result may be obtained by lapping the distal margin of the lower lateral incisors over the mesial of the cuspids. This will reduce the discrepancy by 1 mm. on each side. The tendency for relapse of the upper anteriors is not so great, and a 2.5 discrepancy can be corrected without resorting to extraction and satisfactorily maintained.

When lower second bicuspids are congenitally missing and no discrepancy exists in the maxillary arch, the case often presents a problem. If there is considerable crowding of the lower anteriors, the deciduous molars should

be extracted and spaces closed. The maxillary teeth may be moved to secondary occlusal relation with the lowers, and maintained favorably. The upper second molar must be kept at occlusal level until eruption of the lower third molar. Such a case may be treated more satisfactorily by eliminating the upper second premolar. If no maxillary discrepancy exists, distal positioning of the anterior teeth may be prevented by the employment of stationary anchorage in the anterior region during the space-closing operation. If the deciduous roots exhibit no resorption and the discrepancy and malocclusion are minor, the patient can be served best by non-treatment, as these teeth often last as long as their permanent teeth.

We frequently see extraction of upper bicuspids in deep-bite maxillary protractions with even anterior alignment where no mandibular discrepancy exists. These cases, in my opinion, can be treated best without extraction. In practice over the years, these are the cases that have demonstrated the most successful maintenance. They do not appear to be maxillary discrepancy cases, but have moved forward one full cusp, possibly because of environmental pressure, disbalance, early loss of deciduous tooth structure, or perhaps accidental or chance misguidance into occlusal relation. Removal of upper bicuspids invites the return of a deep-bite condition which eventually will cause engagement of the lower incisors with the necks of the upper anteriors and the return of the complicated and spaced maxillary protraction.

There is another type of case which responds favorably to treatment and maintenance without extraction, and that is the Class II, division 2 case. The crowding of the lower anteriors is often caused by their abnormal lingual inclination resulting from the posteriorly directed pressure of the upper central incisors, and is not a symptom of an actual arch discrepancy. These cases, which usually exhibit a complete cuspal displacement in arch relation, will require very little distal placement of the maxillary teeth, because the mandible is locked in a pseudo-distal position which, when released in treatment, assumes its normal position. These are the cases which, if left untreated, lead to temporomandibular joint disturbances in adult and life. The same displaced position of the mandible will be found in some of the deep-bite Class II, division 1 cases, and probably accounts for the notably successful maintenance of those of the type previously described.

There are cases in which only the upper bicuspids should be extracted. These can be recognized by the thin bone in the maxilla and the extreme crowding usually characterized by displacement of the lateral incisors lingually, or blocked-out cuspids. In the case of Class III malocclusions, removal of upper bicuspids may serve to increase the deformity, and it is often the best strategy to take advantage of the possibility of moving the upper anterior teeth forward somewhat beyond their normal positions in order to make less obvious the mandibular protrusion.

The X-rays should be carefully studied before and after the cast measurements are made. The findings may influence our plan of treatment. We should, of course, look for missing teeth, supernumerary teeth, anomalies in teeth and roots, root-resorption, bone density, normal resorption of deciduous roots, normal development of succeeding secondary teeth, cysts, foreign bodies, caries, condition of proximal restorations, second molar position, and stage of development and position of third molars. The two latter factors will influence our decision in borderline cases. If the mesial drift of the first molars has already taken place

and the lower second molars appear to be in contact with the first molars below the distal height of contour, then we can be reasonably certain that no effective distal positioning is possible, especially if the third molar crown is also in contact with the second molar. On the other hand, quite frequently we find a fairly generous space of possibly two millimeters between the first and second molars at this point in the eruption of the second. Just how much additional room can be expected in this area after age eleven is not predictable. Studies have been made, but there is not sufficient evidence to warrant dependence upon a crowded condition of the molar crowns being greatly relieved when root development is completed.

Cephalometric X-rays can well augment the usual full-mouth pictures. From headfilms one may gain an appreciation of the varying relationship of structures associated with the dental apparatus and obtain a more complete conception of the direction and progress of growth. I am one who does not use them in regular office procedure, but I am keenly interested in every film or tracing that I am able to observe and study. There is a limit to the amount of preparatory work which we can do in private practice and still maintain treatment technique standards. So far, I am content to learn what I can from the scientific presentations in order to gain more information on growth direction and progress and relation of associated structures. For the individual case at hand, I am not convinced that my time and efforts would be profitably rewarded. It is possible that cephalometric X-rays may supplant photography. If and when that is convincingly demonstrated, I will become a cephalometer man and take my cameras down, except for an occasional shot or two to record something that has already happened, to satisfy my ego, and to amaze the public with the marvelous things we do.

This brings us to the final step in diagnosis — the photographic analysis. Just as with cephalometric X-rays, photographs mean more when you have taken and studied many. It is surprising that, when the patient was present, many things about the face and head were not accurately observed. And then, when the diagnosis was being prepared for analysis, the patient was not present. We use 1/3 size photostatic enlargements of the front view with the face composed, front view smiling, profile, and a life-size oral view. The usual planes are marked on the prints: orbital, horizontal, and mandibular, and the mandibular angle is recorded. We observe these photographs, first noting the general form of the face and head, then the relationship of the lower to the upper part of the face. Are the lips in a relaxed position; do they appear to be distorted by the malposition of underlying structures? Does the chin appear to be weak or receding? A silhouette of an attractive lip relation and lower profile may be superimposed over the profile photograph to better visualize what improvement might take place if the lips were retracted, or what it would mean to the face if they were brought forward. We can expect, approximately, 3 mm. lengthening of the face from the horizontal plane to the symphysis from natural growth between the eleventh and thirteenth year. This lengthening will reduce some of the protrusive appearance by virtue of its relation to a longer line. The lower lip is thrust forward with reduced curve in Class I double protrusions, and in Class II arch relation it is curved markedly at degrees varying to over 90 degrees.

In dental protrusions where the rotations are extreme, the lips often assume normal relationship and should not be

disturbed in any way. Care must be taken to preserve this relationship by assuming that the anterior teeth are already located in their correct labiolingual anatomic positions. The maxillary discrepancy cases will usually exhibit prominence of the lower lip, very little curvature, and a flattening of the entire profile below the nose. It is difficult to improve this with treatment.

The Frankfort-mandibular plane angle should be our concern in this study. Dr. Tweed's information on this has proved to be correct. If the angle is over 35°, we can expect little improvement following correction of the dental condition.

After evaluation and consideration of all these factors, the diagnosis and plan of treatment are written up in condensed form on the back of the graph, which is attached to the working card so that it is readily available. It should include, in order: type of malocclusion; etiology; arch discrepancy in mm.; arch relation; position of third molars; and photographic analysis. Below this is a brief outline of the treatment plan and retention. Five lines will usually suffice. If it is long and involved, it will not be referred to and might just as well be placed in the filing case with the other masses of material gathering dust.

616 University Ave.