Objectives in Correcting the Mesio-Distal Relationship in Class II Malocclusion*

CARL BREITNER, M.D.†
New York, New York

THE ATTEMPT to change the relationship between upper and lower rows of teeth by reciprocally acting forces in order to correct malocclusions is almost as old as orthodontic science. One of the first devices described for this specific purpose was presented in Chicago at a meeting of the Chicago Dental Society in 1893 by Calvin S. Case.[4] The application of the "intermaxillary force" became known among orthodontists as the "Baker Anchorage," probably because Angle[1] called it so in his textbook. Case, however, claims priority, and he is probably the first to take a broader view of this type of treatment because he considered the possibility of changing facial contours. He writes, "The facial outlines should always be considered because they frequently mark the course that should be pursued in a correction of the dental irregularity. . . ."

It seems as if in the following three decades, this possibility of effecting changes in the facial contours had been much neglected in literature. It was, however, discussed sporadically by A. P. Rogers,[10] Jackson,[6] Phillips,[9] Lischer,[8] Seward[13] and others. Although some authors have attempted to stress the importance of the final esthetic result produced by different types of appliances, many authors—including the modern representatives of the Angle school—are convinced that all the orthodontist can do is to produce changes in the alveolar process.‡ They maintain that the alveolar process is composed of a different type of bone which reacts to our treatment, whereas other parts of the skull do not. The general shape of the bony parts of the skull, so they contend, is determined by inherited growth patterns and therefore unalterable. Because of this conception they feel that the orthodontist should confine his efforts to the alveolar process.

Thus today we are still faced with the question: *Is the endeavor to adjust the design of our orthodontic appliances to esthetic needs a futile undertaking, or can we attempt successfully to influence facial contours?*

General Considerations

Prerequisite to answering the question raised above is knowledge of the localization of the tissue changes which occur during artificial changes in the occlusion. From such knowledge we may deduce where the limitations of Class II treatment lie. If the only theater of tissue changes is the alveolar process, the attempt to carry orthodontic influence beyond that area would seem futile. *If, however, definite bone changes at other areas can also be*

* Read before the Chicago Association of Orthodontists, November 25, 1940.
† Columbia University School of Dental and Oral Surgery, New York City.
‡ Brodie[3] writes, "The most startling finding was an apparent inability to alter anything beyond the alveolar process."

discovered during artificial changes in the occlusion, it seems logical to assume that these areas can be affected by treatment.

Experiments for the purpose of throwing light on this question were carried on over a period of years by the author. Monkeys were subjected to orthodontic treatment and subsequently all areas possibly involved were investigated histologically. Some of the results were first published in this country by F. B. Noyes and Ernest Myer, and later by Kronfeld in his textbook of histopathology.[7] They were recently thoroughly described by the author in an article entitled "Bone Changes Resulting from Experimental Orthodontic Treatment."[2] Among other things, these investigations demonstrated that:

The application of intermaxillary rubber bands as applied in Class II treatment produced changes in the occlusion as the result of the following bone changes:

A) *In the alveolar processes*

1. The mandibular teeth, including the alveolar processes, were moved forward.
2. The maxillary teeth, including the alveolar processes, were moved backward.

B) *In the position of the mandible*

The glenoid fossa of the temporomandibular joint was displaced mesially by new growth and resorption of bone, thereby creating a new more mesial position of the mandible. (Fig. 1, A, B, & D)

C) *In the shape of the mandible*

1. Condyle and neck grew upward and in dorsal direction. (Fig. 1, C)
2. The angle of the mandible was widened. (Fig. 2, A and B)

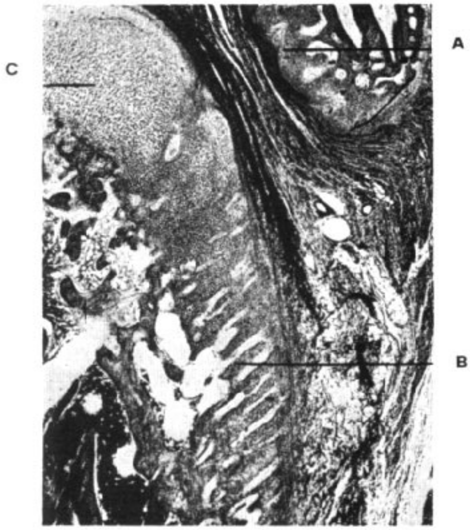
This histological evidence proves that changes in the occlusion were due to bone transformation at many localizations. The most extensive changes probably occurred in the alveolar process itself but the other changes described can be taken as a proof that the influence of orthodontic appliances is not restricted to the alveolar process. The extent of this influence is not surprising. The findings can easily be correlated with the following considerations.

ad A. The possibility of influencing the alveolar process is undisputed. This area which originally was given the sole responsibility for changes in the occlusion reacts most noticeably to all forces applied to the teeth. Since most orthodontic appliances act on the teeth, the tissue reactions at other localizations were overshadowed by the marked gross evidence of change in the alveolar process.

ad B. The possibility of changes in the temporomandibular joint is generally accepted. There is a growth center in the condyle of the mandible and we know from experience in prosthetic dentistry that the temporomandibular joint undergoes metamorphosis during life according to changes in the occlusion, and also with the use of artificial dentures. Without this ability of the temporomandibular joint to adapt itself to a new function the prospects of a dentist to provide a patient with a comfortable artificial denture would be very poor. Various methods have been contrived to pro-

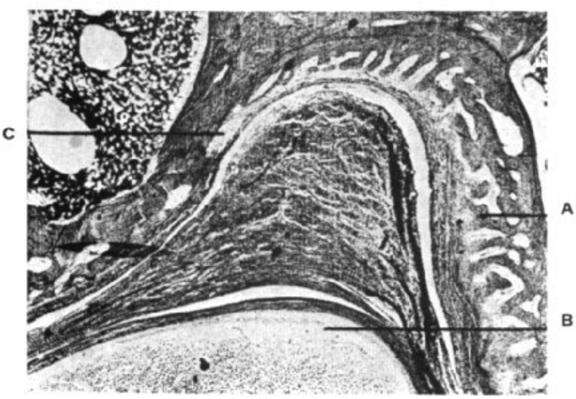
A

Sagittal section through a temporomandibular joint of a Macacus rhesus monkey. A, Disc in the glenoid fossa. B, Head of the condyle. C, External pterygoid muscle. D, Mandibular canal.



C

Posterior side of the head of the dyle. A, Bone deposition in the gle fossa. B, Bone deposition on the cor posteriorly. C, Cartilage.



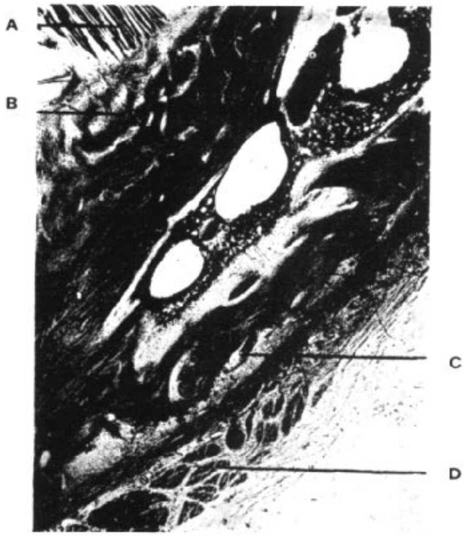
B

Glenoid fossa. A, Deposition of new bone. B, Cartilage on the head of the condyle. C, Bone resorption.

D

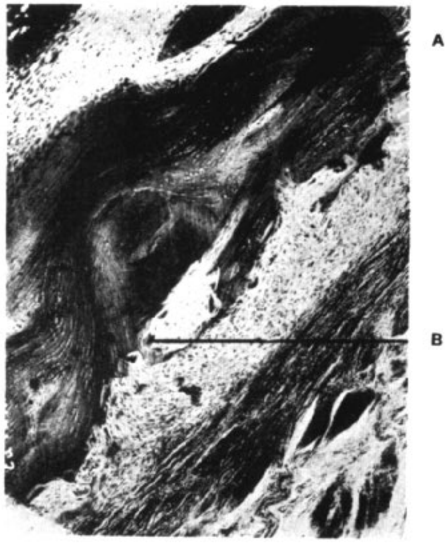
High magnification of part of th terior wall of the fossa. A, Giant (osteoclast) as evidence of bone resor B, Articular disc.

Fig. 1.—Illustrations of changes in the fossa and condylar head of the temporomandibular joint. (Reprinted from "Bone Changes Resulting from Experimental Orthodontic Treatment," Carl Breitner, by courtesy of the *American Journal of Orthodontics and Oral Surgery.)*



A

Angle of the mandible. A, Internal pterygoid muscle. B, Bone deposition. C, Bone resorption. D, Masseter muscle.



B

Angle of the mandible. A, Bone deposition toward the bone marrow. B, Giant cells on the outer border of the angle.

Fig. 2.—Illustrations of bone change in the angle of the mandible. (Reprinted from "Bone Changes Resulting from Experimental Orthodontic Treatment," Carl Breitner, by courtesy of the *American Journal of Orthodontics and Oral Surgery.*)

duce the occlusion in a new denture according to the given condylar path, yet none of them seems to be exact enough to really adjust the occlusion to this path. Subsequent adaptation of the joint is still the basis of successful full denture prosthetics.

ad C. The possibility of influencing the mandibular angle through orthodontic treatment is disputed. Because of the contention that the bones of the skull, including the mandible, are bound to develop and to be maintained according to an inherited growth pattern, some authors maintain that permanent changes in the angle cannot be achieved by artificial means. Allan G. Brodie[3] demonstrated by careful statistical recording in children from 3 months to eight years of age that the width of the gonial angle does not change during this period of life and he believes that the angle remains unchanged throughout life. This belief contrasts with the traditional conception of anatomists and anthropologists that the angle is subjected to age changes. Hrdlicka[5] publishes the following results of measuring 3,006 lower jaws: the mandible " . . . presents unique age changes and differs characteristically in the two sexes. It . . . is capable of remarkable functional adaptations. . . . Within the well established adult life, and before senility with its extensive loss of teeth sets in, age alone apparently has no material influence on the gonial angle. . . . In many individual cases the angle differs more or less on the two sides. . . . Yet in the long run, strength or weakness of the bone do probably affect the angle, as do the time of eruption and the size of the teeth, the presence or absence of lower third molars, and the activity and mass of the internal pterygoid muscle. Heredity, too, in all possibility, already plays a role."*

Rogers and Applebaum[11] demonstrated at the last annual meeting of the American Dental Association that the angle is generally wider in edentulous mandibles and especially wider than normal in cases where posterior teeth were missing. They attributed this phenomenon to atrophy due to lack of function. However, whether or not the angle changes under normal conditions during life is not the salient question from the aspect of orthodontic treatment. *What the orthodontist wants to know is whether the angle changes under abnormal conditions such as altered function due to loss of teeth or orthodontic appliances.* It is not even of great import whether potential changes in the angle are temporary or permanent because a transitory change in the angle, if retrogressive after treatment, can be compensated for by bone changes elsewhere, for instance in the condyle. Thus beneficial changes in the facial contours achieved originally during treatment by changes in the angle can, if normal occlusion was created, become permanent by bone transformation at localizations where there is a growth center.

There are, however, other indications that the width of the gonial angle in an individual is not predetermined at birth but subjected to influences of external or internal origin during life. If we look at the picture in Fig. 3 showing a radiograph of the head of an acromegalic patient taken from a recent publication by Schour and Massler[12] we see that the angle is extremely wide. This is typical of this disease which sometimes is due to an adenoma of the pituitary gland, a condition frequently acquired during life. Schour and Massler even contend that the extreme over-growth of the mandible can be produced only by disfunction of the gland after the sixth year of life. Recalling the findings of Hrdlicka, Rogers and other anatomists and anthropologists, in addition to the histological evidence of experiments, we may conclude that functional (physical) and internal (endocrine) influences cause variations of the gonial angle after birth.

In additon to the histological findings already published new investigations are being conducted at the orthodontic division of the Columbia University School of Dental and Oral Surgery. These investigations include histological examinations as well as actual measurements of the gonial angle, before and after different types of treatment on monkeys. For the measurements we are using a sort of cephalometer (reproduced in Fig. 4) to repeat radiographs under the same conditions at different times. It fixes the head of the animal at three chosen points. Figure 5 shows a radiograph taken with the help of this appliance. We hope to establish further proof that the shape of the facial bones is subjected to postnatal influences. Thus the effort of

---

* It is my opinion that as far as age changes under *normal conditions* are concerned no investigations of different individuals can match Brodie's exact measurements on the same individual at different times and we await with great interest the results of further investigation. (Brodie also gives a satisfactory explanation of the discrepancy between his opinion and that of other investigators. Incorrect or inaccurate readings are blamed.)

However as far as changes of the angle produced by *changes of function* are concerned Brodie's investigations do not prove so far that the angle is unchangeable.

Fig. 3.—Acromegalic skull from Schour and Massler, "Effect of the Endocrines on the Teeth, Jaws and Facial Skeleton," *Proceedings of the Dental Centenary, Maryland State Dental Society and the American Dental Association*, p. 149, Baltimore, Waverly Press, 1940.

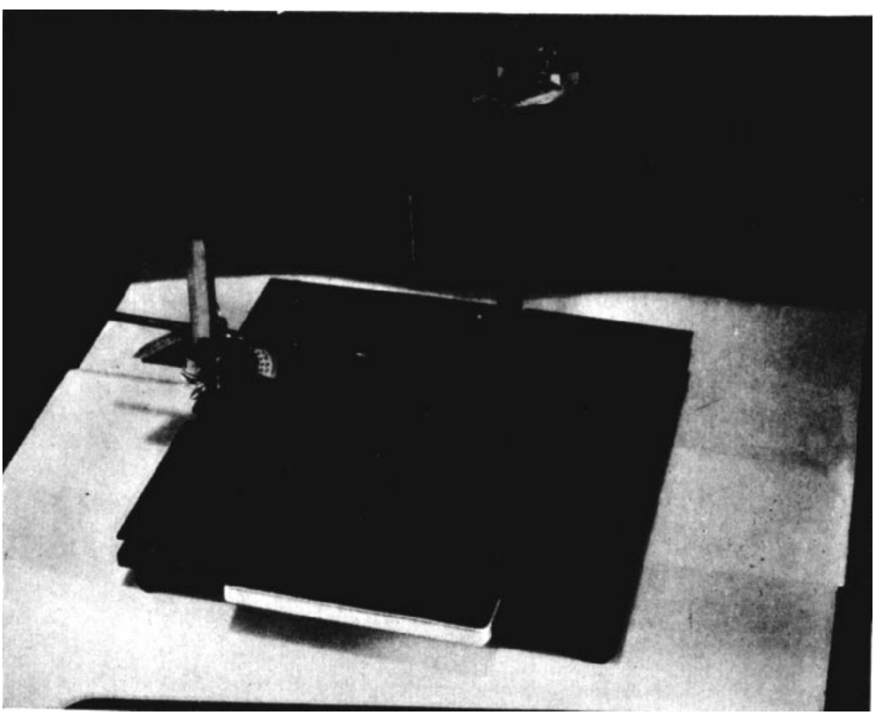


Fig. 4.—Head positioner designed to repeat radiographs under the same conditions at different intervals.

many orthodontists to extend their field of endeavor beyond the alveolar process may be justified.

Practical Applications

Before we try to evaluate different types of Class II treatment as to their efficiency in influencing facial contours it may be useful to present the point of view of orthodontic treatment from which we shall discuss our problems. The jaws and teeth of humans as well as those of animals can be regarded

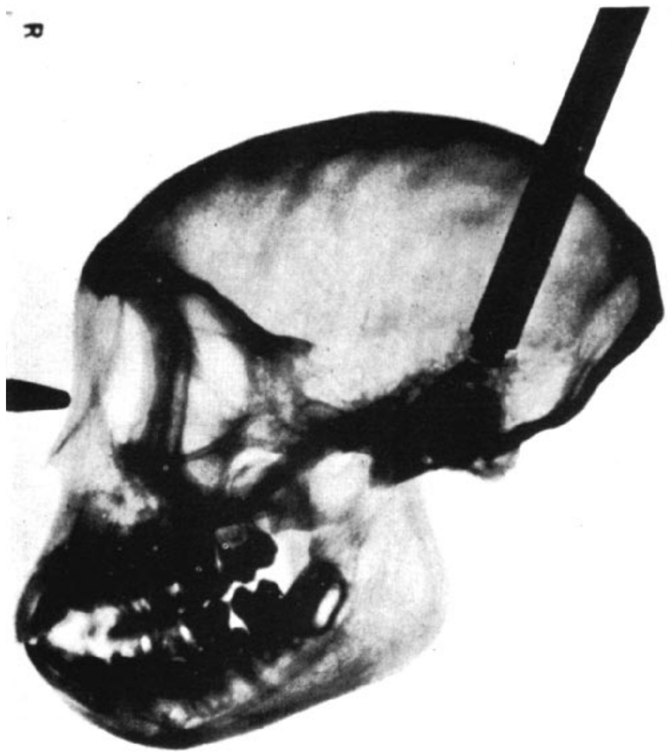


Fig. 5.—Reproduction of a radiograph made utilizing head positioner shown in Fig. 4.

as a skillfully developed architectural structure. The shape and function of this structure are primarily determined by inherited factors. These inherited factors constitute growth patterns according to which the organs develop under normal conditions.

As physicians, as well as scientists, we must accept this given factor and can never attempt to alter it, except perhaps by eugenic procedure. There is, however, a second factor involved which offers more possibility for human interference. From our experience in different types of orthodontic treatment, from experiments and from observation of changes during the post-therapeutic period, we may deduce that the development and persistence of this architectural structure according to the given inherited factors are based on the maintenance of a certain equilibrium or balance. We shall call this *Functional Equilibrium* (F.E.). As long as conditions in the jaws are stationary this equilibrium is present in both normal and pathological cases. As soon as it is disturbed, changes take place. These changes tend to re-establish the balance and they continue until this balance has been re-established.

Before we go further, let us first define what we shall understand by this balance. It is the balance between the material of which the masticatory apparatus is built and the forces which are applied to it, at rest and in function. The *material* is the skull, the temporomandibular joint, connective tissue, mucous membranes, the teeth in their fibrous suspension, and the peridental membrane. The *forces* which are applied to the dental apparatus may be divided into endogenous and exogenous forces. Endogenous forces are those forces which are present in a normally functioning masticatory apparatus. They originate, like all active forces in the body, from muscle cells. (Masticatory and facial muscles.) After alterations, forces of elasticity may be created which also belong in the group of endogenous forces. Exogenous forces are those introduced by artificial means such as springs, elastics, actively contracting threads, swelling cellulose materials (wood, cotton) etc. *The object of any active orthodontic treatment is to disturb the balance between this material and these forces to the purpose of causing changes in the organs in a desired direction.*

The equilibrium can be disturbed by different means, principally in two ways: 1, by altering the material; and 2, by altering the forces. Any alteration of either material or forces disturbs the balance and causes changes. The removal of essential material may cause collapse of the structure.*

Both endogenous and exogenous forces can be altered by the orthodontist. Alteration of exogenous forces is self-explanatory. It means the introduction or elimination of orthodontic appliances in the common sense. Endogenous forces may also be altered. It means change of function which can be achieved by introduction or elimination of material. Elimination of material comprises extraction of teeth or surgical removal of other tissues, loss of tissue due to diseases and the like. Addition of material comprises introduction of bite plates, oblique planes, splints, restoration of lost teeth, etc. The material may also be altered in its composition and physical properties.

Here are some examples: If we introduce an actively working orthodontic appliance such as a lingual arch with auxiliary springs we add to the present system an exogenous force. (To be exact, we add material and force but the resultant of the appliance is an exogenous force.) Thus we are disturbing the functional equilibrium. If we remove the appliance, we do the same. If we cause the patient to wear a bite plate regularly to raise the bite in a particular region, we disturb the equilibrium by addition of material. Specifically the balance is disturbed in this case by changing the length of

---

* The architectural structure of the dental apparatus may be compared to a pontoon bridge. *There is material:* barges, ropes, anchorage on both banks, etc. *There are forces* applied to the structure, such as the current, wind, gravity, etc. Any change in the material will alter the shape of the structure. If we remove a barge, the bridge will bulge; likewise if we add one, the shape of the bridge will change. If we remove essential parts, like rope or anchorage the structure will collapse. Any change of the force would likewise alter the shape of the structure. Whether the speed of mass of the current increases, or the wind changes, whether we put a heavier load on the bridge or tighten the rope, the shape of the bridge will be influenced. (If we alter both material and forces simultaneously we may find another equilibrium without causing changes in shape.)

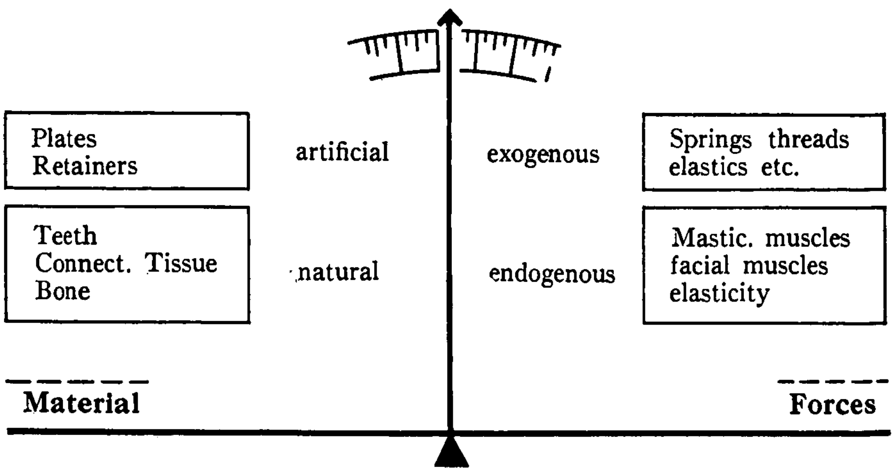
some muscles thus altering their tone, force and manner of action. If we cause a patient to perform lip exercises we strengthen a particular muscle group. In this manner we increase present endogenous forces.

The necessity of retaining metamorphosis achieved in orthodontic treatment can be easily explained according to this theory. As pointed out before, the removal of an appliance which was still active at the time of removal is an alteration of forces. The removal of an appliance after it had been passive for a time (such as a retainer) is a change in material. Both affect the equilibrium, and retrogressive changes take place, most of which are not desired. Only gradual removal of material or forces can be effected without marked disturbance of the balance because under such conditions natural material (or forces) may take over the function of the removed items.

We shall now discuss different means of Class II treatment as regards their physical action and their efficiency in changing facial contours. These therapeutic means are:

1. Intermaxillary rubber bands.
2. Plates and splints
3. Jumping the bite
4. Hinges
5. Myofunctional therapy.

Intermaxillary rubber bands are the most commonly used means of producing changes in the mesio-distal relationship of the upper and lower dental arches because they act favorably under various conditions. These rubber bands represent an exogenous force introduced to disturb the F.E. Their action depends not so much upon the intensity of the force applied as upon the consistency of its application. Since the force is attached primarily on the teeth, it is the teeth—or more accurately, the alveolar process—which react most noticeably; but the rubber bands also act on other areas of the skull. This has been pointed out before and proved by histological investigation. There arises the important question of whether it is possible



Functional equilibrium of the architectural structure forming the dental apparatus.

Fig. 6.—Diagrammatic representation of functional equilibrium.

to control the resulting tissue changes in specific areas by the design of the appliance. "Generally the idea seems to be well founded that the relation between the degree of the applied force and resistance of the anchorage might produce bone changes varying in degree at given localized areas. If, for instance, an anchorage is not rigidly fixed, permitting the anchored teeth some degree of tilting, intermaxillary elastics will certainly produce more direct movement of the teeth themselves. In this way normal occlusion will be achieved before appreciable changes in the joint and angle could occur. In other words, a given force might act to produce bone changes in the alveolar process varying in degree according to the appliance used. The period of duration of treatment and the effect upon the joint may thus be varied."[2]

If we desire "to move the body of the mandible forward to its maximum degree, it becomes important, therefore, to obviate any forward movement of the teeth themselves from their alveoli. *Whatever anterior movement of the teeth from their alveoli ensues must necessarily reduce the amount of forward movement of the body of the mandible.*"[2] The strength of the force apparently does not influence the amount of bone changes in the temporomandibular joint and the angle. The F.E. is disturbed, which produces transformation of bone in these areas. However, this bone transformation is not accelerated by a greater disharmony in equilibrium, whereas an increase in direct influence upon the attacked teeth tends to break down their resistance and to move them faster from their alveoli. In addition, strong elastics cause discomfort to the patient, causing him to keep his mandible voluntarily in a more mesial position. Keeping the mandible actively in a more mesial position apparently does not cause bone changes in the joint which might make this new position final and unchangeable. More will be said about this phenomenon in the discussion of myofunctional therapy.

The use of strong elastics under very slight tension has also been advocated. (McCoy) In this case the tension subsides entirely as soon as the patient brings his mandible in a more mesial (Class I) position. The action of this scheme is comparable to the action of hinges, which would be a basically good means of therapy could other disadvantages be eliminated.

We conclude from all these considerations that we must use the strongest possible anchorage if we want to produce noticeable changes in the temporomandibular joint and the angle. If the elastics are applied to an anchorage in which many teeth are rigidly connected permitting only bodily movement, the amount of changes in the alveolar process, other conditions being equal; will be less. An edgewise or ribbon arch represents a very strong anchorage if it is inserted passively. If the arch is used both for the purpose of producing various movements of individual teeth and as an anchorage for the action of elastics, a weakening of the anchorage may be expected.

The age of the patient affects the chances of altering facial contours. Our aim of using the strongest possible anchorage is, of course, more easily attained in the complete permanent dentition. In patients of this age, however, we are partly deprived of the important assistance of natural growth. Therefore generally better esthetic results are obtained if treatment is instituted in the mixed dentition. We may not be able to establish the strongest possible anchorage; still, if normal occlusion is attained at this age or earlier by moving teeth from their alveoli, subsequent development of the mandible and the temporomandibular joint will in most cases produce normal facial contours. We should not deprive ourselves of this advantage which may prove more valuable than the most cleverly designed appliance used later.

Bite Planes are more and more frequently advocated for correction of Class II malocclusions. They were designed primarily to correct or overcome the deep overbite associated with the anomaly in the anterior region, in other words, to reduce the exaggerated curve of Spee. Their beneficial influence in correcting mandibular distocclusion has been proved time and again. Many cases have been remedied by this means alone.

The *flat bite plane* usually used on a vulcanite plate disturbs the F.E. by adding material. Thus it changes the action of the masticatory muscles and there follows an adaptation of the bone (transformation) to the new function. The flat bite plane acts on three different localizations:

1. The teeth and alveolar processes
   a. In the incisor region (depression)
   b. In the molar region (elongation)
2. The angle and the mandibular body
3. The temporomandibular joint

Histologic evidence of tissue changes in these areas has been published. In our aim to correct facial contours our concern is again to reduce the prevalence of the changes in the alveolar process. The most striking effect of the bite plane is the manifestation of a space between the upper and lower incisors. "Three factors co-operate to produce this condition. Two of these are the depression of the occluding mandibular incisor teeth and the elongation of the molar teeth, and the third is the gradual closing of the space between the opposing posterior teeth due to flattening the mandibular arch. All these reasons explain the rapid action of bite planes in correcting the curve of Spee, but they explain also why the bite plane placed in the anterior region does not result in the complete correction of Class II anomalies."[2] After a space equal to the thickness of the plate has been created between upper and lower incisors, the F.E. is re-established. Further wearing of the plate therefore does not produce more changes. On the other hand, removal of the plate would again disturb the F.E. and invite retrogression. A suggestion for the completion of bite plane therapy by subsequent posterior splint has been offered.[2] It is a "kind of splint which is to cover the incisal edges of all the anterior mandibular teeth and occlusal surfaces of all the posterior mandibular teeth. This splint is to be so designed as to act as a bite plane for the posterior teeth, leaving a space between the anterior teeth.

This would serve to retain the corrected curve of Spee, to produce strain again on the same masticatory muscles with the resultant action producing change of the mandibular angle. In addition it would serve to depress both the maxillary and mandibular molar teeth, and, lastly, to produce additional changes in the joint."[2] The action of this appliance has recently been tested in an experiment on a monkey with a good gross result. Findings and conclusions will be offered after the completion of the investigation. The application of this kind of therapy would mean the elimination of any horizontal movement of teeth in the alveolar process. Thus the change in the occlusion would be effected wholly to the benefit of the contours of the face.

The inclined plane has been found useful in many cases. It can be applied in the form of a gate cemented to the upper anteriors or as a removable vulcanite plate. Its action can be explained similarly to that of the flat plane. There are, however, additional effects. These effects are similar to those produced by jumping the bite or the application of hinges, both of which are discussed later.

Jumping the bite is probably the oldest attempt to change the mesiodistal relationship between upper and lower teeth. It was introduced by Kingsley around 1880. Jumping the bite means disturbing the F.E. by introducing new material for the purpose of creating additional endogenous forces. The introduction of new inclined planes on the occlusal surfaces of the teeth makes it impossible to close the mouth to the rest position. It therefore

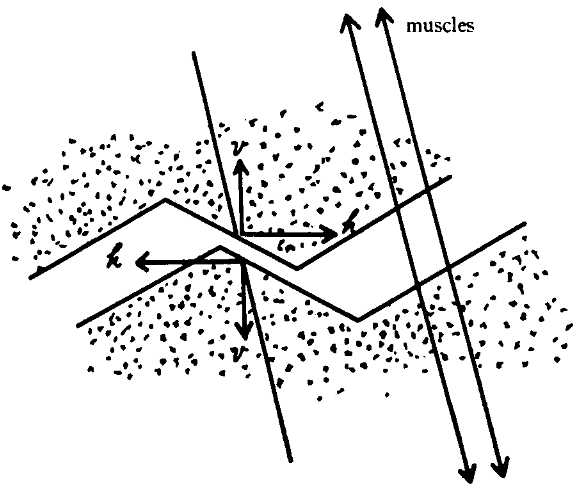


Fig. 7.—Diagrammatic representation of the component forces active in jumping the bite.
h = horizontal component
v = vertical component

means raising the bite in all regions where inclined planes are applied. In this way the tone and strength of the masticatory muscles are changed, provoking bone transformation in order to re-establish the F.E. The new additional forces act primarily in the direction of the masticatory muscles but are split into two components, one depressing the teeth, and the other pushing them in a horizontal direction. (Fig. 7) The horizontal component (h in Fig. 7) is the one which produces whatever change occurs in the occlusion. The vertical component (v in Fig. 7), however, is also present and harmful. It decreases the resistance of the teeth and because of the breaking down of the resistence in the alveolar bone the horizontal component produces rapid migration of the teeth from their alveoli, leaving little space for action in the joint (see discussion of rubber bands). Practically, therefore, jumping the bite acts primarily on the alveolar processes. The occurrence of tissue changes in joint, angle and alveolar process has been established histologically and the deleterious influence of the vertical component was clearly manifested.[2]

The harmful vertical component can hardly be eliminated, but its magnitude can be varied by the attitude of the patient. If he—in order to avoid discomfort, or in his desire to accelerate the action of the appliance—makes a habit of pushing his mandible forward voluntarily, then the vertical component is almost entirely eliminated because entire closing of the mouth in a Class I position was planned in the appliance. But in this case what becomes of the horizontal component? It, too, is gone. The habit of voluntarily pushing the mandible forward is probably responsible for the cases frequently experienced by orthodontists where jumping the bite produced only the habit of keeping the mandible in a corrected position without actual bone transformation. In other words, the patient was still able to bring his mandible into the original position, and probably did so while he slept. Thus permanent results were not attained. A similar danger is sometimes encountered in the application of the inclined plane, which, as pointed out before, is a mixture of the horizontal plane and jumping the bite in its actions. We shall encounter this *habitual* correction again in the discussion of myofunctional therapy.

Hinges applied between anchorages cemented to upper and lower arches in order to enforce a new, corrected position of the mandible have been advocated by Herbst, in Germany. Such hinges mean the introduction of new material for the purpose of creating additional endogenous forces. The effect of hinges depends largely on the strength of the anchorages to which they are attached. If these anchorages include only a few teeth (Herbst) the teeth will be loosened and moved very rapidly from their alveoli. If, however, the anchorage is a very strong one, permitting only bodily movement of a great number of teeth, and if the hinges do not break as often happens, beneficial results can be expected in some cases. The hinges are, however, extremely annoying to the patient. Therefore some patients attempt to overcome this annoyance by trying to keep the mandible voluntarily in a new position. In this case no forces are active on the alveolar processes. The effect of hinges on the temporomandibular joint and angle has not yet been investigated histologically.

Myofunctional therapy was first introduced by A. P. Rogers. It is the attempt to bring about tissue changes by increasing the strength of particular muscle groups through training; in other words, to disturb the F.E. through additional endogenous forces. There is no doubt of the value of training facial muscles or the tongue in order to create additional endogenous forces to act on the dental arches. To change mesio-distal relationship, however only the masticatory muscles can be used. To correct a Class II, training of the external pterygoid muscles (the combined action of which pulls the mandible forward) is advocated, and if we can attain a solitary strengthening of these muscles, transformation of the bone in the temporomandibular joint or elsewhere to re-establish the F.E. must necessarily ensue. This is the explanation given for numerous successes attained from the use of this method There are, however, failures also reported. Their explanation may be similar to that given for other failures such as occur from the use of jumping the bite and sometimes from the use of inclined planes. Again it might be the habit of keeping the mandible voluntarily in a Class I position which reduces the probability of bone changes in the temporomandibular joint and at the angle. We may therefore suggest advising patients to avoid keeping the mandible consciously in a forced position. It would certainly be worth while to test this suggestion on a large number of cases to see whether failures could thus be eliminated.

Roger's myotherapy of Class II concentrates on correcting facial contours. Whatever favorable results occur cannot have been caused by changes in the alveolar process. This can be taken as a last argument in addition to those given earlier that it is possible to cause changes of facial contours and that the orthodontist therefore should attempt to produce them in given cases rather than confine his efforts to the alveolar process.

Summary

After many decades of more or less successful treatment of Class II malocclusions, we are still faced with the question: is the endeavor to adjust the design of our orthodontic appliances to esthetic needs a futile undertaking, or can we attempt successfully to influence facial contours? This question is discussed from a general point of view, and evidence is given for the assumption that the orthodontist can successfully extend his efforts beyond the alveolar process.

Various means of correcting the mesio-distal relationship in Class II malocclusions are examined as to their potential efficiency in affecting facial contours. Other factors in Class II malocclusions, such as tooth inclination, narrow arches, etc., require special attention, and must be considered separately.

Experimental and histologic investigations[2] have definitely shown that bone changes in orthodontic treatment occur in the temporomandibular joint, gonial angle and ramus. This is an indication that the efforts of orthodontists should not be confined to the creation of changes within the alveolar processes.

623 West 168th Street

References

1. Angle, E. H. *Treatment of Malocclusion of the Teeth,* ed. 7, Philadelphia, S. S. White Dental Manufacturing Co., 1907.
2. Breitner, Carl. "Bone Changes Resulting from Experimental Orthodontic Treatment," *Am. J. Orthodont. and Oral Surg.* 26:521, June, 1940.
3. Brodie, Allan G. "Some Recent Observations on the Growth of the Face and Their Implications to the Orthodontist," *Am. J. Orthodont. and Oral Surg.* 26:741-57, Aug. 1940.
4. Case, Calvin S. *Dental Orthopedia,* Chicago, C. S. Case Co., 1921.
5. Hrdlicka, A. "Lower Jaw," *Am. J. Phys. Anthrop.* 27:281-308, Sept. 1940.
6. Jackson, V. H. Orthodontia and Orthopedia of the Face," *D. Cosmos,* 54:357, March, 1912.
7. Kronfeld, R. *Textbook of Dental Histology. Histopathology of the Teeth and Their Surrounding Structures,* Philadelphia, Lea and Febiger, 1933.
   ——— *Textbook of Dental Histology and Comparative Dental Anatomy,* Philadelphia, Lea and Febiger, 1937.
8. Lischer, B. E. "Dento-Facial Deformities," *Nat. D. Assn. J.,* 8:907-11, July, 1921.
9. Phillips, F. "Orthodontia and Facial Orthopedia," *D. Cosmos,* 50:149-53, 1908.
10. Rogers, A. P. "The Correction of Facial Disharmonies," *D. Cosmos,* 49:850-52, Aug. 1907.
11. Rogers, W. M. and Applebaum, E. "Changes in the Mandible Following Closure of the Bite with Particular Reference to Edentulous Patients," *J.A.D.A.* (in press).
   ——— "Co-ordinating Natural and Artificial Methods of Treatment," *Int. J. Orthodont.* 10:63-84, 1924.
12. Schour, I. and Massler, M. *Effect of the Endocrines on the Teeth, Jaws and Facial Skeleton, Proceedings of the Dental Centenary Celebration,* Waverly Press, Baltimore, March, 1940.
13. Seward, J. T. "A Consideration of the Function of Mastication and its Effect on the Form of the Dental Arch and the Architecture of the Skull," *Australian J. Dent.* 38:453-58, 1934.