

# The Application of the Principles of the Edge-wise Arch in the Treatment of Malocclusions: I.\*

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AT PRESENT there is little that is basically new or original in orthodontics, and I assure you that I have nothing entirely new to offer. However, through your Program Committee you have invited me to present my views and to explain my methods of treating malocclusions, and this I am glad to do, though I know that some of the things I say and some of my procedures may not meet with approval from all of you.

To begin with, some definitions and distinctions may be helpful. Orthodontics may be defined as that branch of dental science which has for its object the correction and prevention of malocclusion of the teeth. In my opinion, orthodontic treatment should be divided into two distinct classes:

1. Primary, or true, orthodontic treatment, which has for its object the guidance from the abnormal to the normal of growth and development processes occurring in the dentures of children, and
2. Secondary, or adult, orthodontic treatment, which has for its object the amelioration of abnormalities of occlusion and the improvement of facial contour. This type of treatment is applicable to patients past the growth and development period of life, and is often, of necessity, a compromise.

Unless otherwise specified, what I have to say concerns only primary, or true, orthodontics; that is, the treatment of patients up to about sixteen years of age.

In order that you may clearly understand the evolution of my plan of treatment, I think it necessary to tell you something of what I have been thinking and doing during the past fifteen years. It was in 1927 that I first met my friend and benefactor, Dr. Edward H. Angle. Afterward I came to know him intimately. He was the best friend I have ever had, and I will always consider him to be so. I shall be eternally grateful for the influence, both in orthodontics and otherwise, he has had upon my life. He was the finest man I have ever known, and in my opinion there will not be in our lifetime another who will so constructively influence orthodontics.

I have re-read Dr. Angle's letters to me and briefly reviewed his life many times. Can any of you recall a single year of his life when he stood still, just marking time? I do not believe you can. There was never a time when his mind was not active, and when he was not trying to guide orthodontics into the place it deserves among the sciences and professions. The

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E arch, the pin and tube, the ribbon arch, the edgewise arch mechanism, and numerous other inventions, such as bands, pliers, and the like, were constantly flowing from his mind. Seven editions of his book, each an improvement upon the preceding one, each advancing more scientific views and better procedures, tell us that he was never satisfied and that he always knew that there was still work to be done.

Do any of you believe that Dr. Angle considered orthodontics finished when he laid down his work? Do you believe he thought there could be no further improvements in orthodontic procedure? I am sure you do not. I believe it would be wrong for us to live like parasites on the efforts of one man, and to stop trying to advance our science. In my opinion, it was Dr. Angle's wish and expectation that every one of us would in every way possible continue to promote and improve the science of orthodontics, not less in treatment than in any other of its many phases. Even though we make mistakes, I am sure it is better to try and fail than never to try at all, if we try honestly and intelligently.

For the first six and one half years of my fifteen years in orthodontics I practised under Dr. Angle's direct guidance and supervision. From the time I finished my course in orthodontics until his death, I periodically traveled from Phoenix to Pasadena with suitcases full of models, photographs, and X-rays, seeking his guidance and counsel. I followed his philosophy of treatment religiously, carefully placing bands and ideal arches, correcting all malocclusions, gaining normal arch breadth and *en masse* movements, with all movements going on simultaneously and all phases of treatment completed at the same time.

Few of you, I believe, can realize the discipline I exacted of myself during this period. Nevertheless, the results of my treatment in these six and a half years clearly demonstrated to me that at times I was still unable to obtain the results demanded by Dr. Angle's teachings. By that I mean that too often after occlusion was gained something was lost in the balance, harmony, and beauty of the face. A blind man should have seen that something was wrong, but it took me six and a half years to see it.

I began to visit my orthodontic brothers, to talk with them, to see what was happening behind the scenes in their offices, and to see their results. When they were honest enough to put their cards on the table I found that they were having the same troubles.

We can all put teeth in occlusion, but what about the balance, harmony, symmetry, and art of features, and the permanence of occlusal result that we were taught must be effected if the diagnosis and treatment were right? Some of my results certainly lacked qualities that are essential to the successful and satisfying practice of orthodontics. And further, when I failed to produce the required results I felt that I had failed to interpret correctly Dr. Angle's written words and concepts. For evidence that I was not alone in this matter, I refer you to the majority of the case reports that have appeared in our Journal and in every other orthodontic periodical published in this country for the past fifteen years.

Now, what was the trouble? Let us examine what Dr. Angle says about it. First of all, what does he say about the line of occlusion? Where is it? And what did he try to convey to us when he defined it as being "the line with

which, in form and position according to type, the teeth must be in harmony if in normal occlusion"? He continues:

There can be, then, but one true line of occlusion, and it must be the same as the architectural line on which the dental apparatus was constructed. This ideal line was intended to govern not only the length, breadth and peculiar curve of the dental arches, but the size and pattern of each tooth, cusp and inclined plane composing these arches. And more than this: that as the dental apparatus is only a part of the great structure—the human body—each part and organ of which was fashioned according to lines of design, it must have been intended that the line of occlusion should be in harmony in form and position with, and in proper relation to, all other parts of the great structure, according to the inherited type of the individual. Hence its majesty, and according to our conception of it must be our ability to comprehend, not only the art requirements in each case we treat, but also must it govern our conception of the requirements of the position of the teeth in occlusion and the various operations in treatment. The line of occlusion, then, is more than the tangible or material. It may be regarded as the basic ideal of the dental apparatus, the comprehension and appreciation of which will grow in proportion as our knowledge of the science of occlusion unfolds. . . . We may speak of moving a tooth of the lower arch into the line of occlusion or of moving a tooth of the upper arch into the line of occlusion, but it must always be remembered that there can be but one true line of occlusion, or the line with which each tooth must be in perfect harmony if in normal occlusion.

Does that not mean that there are other requirements as important as a full complement of teeth? Does it not say that we must attain a normal cusp and occlusal relationship? Does it not say that we must attain a normal axial inclination of all the teeth? Does it not say that we must attain a normal relationship of teeth to their respective bony bases? Does it not say that we must attain normal relationship of the jaw bones? And does it not say that the normal function of all the associated parts must be established, and that when we do attain all these results we shall have normal occlusion, harmony, symmetry, balance, beauty, art, and permanence of result, and that, finally, there will be beauty of the face in accordance with its type, and balance of the teeth in relation to the head and body? If that is what it means, there is much to be done, and we had better stop vegetating and get to work.

From what I have observed, there is little doubt that teeth can be occluded somewhere between the lips and the back of the neck in at least a thousand different positions, and I venture to say that most of us have produced a great many of these positions.

I believe Dr. Angle was right when he taught us so earnestly that the line of occlusion is synonymous with harmony, balance, symmetry, beauty, art, and permanence of normal tooth position. I believe also that he was right when he told us that in a permanently successful treatment it is impossible to attain one of these qualities without attaining all the others.

From case reports, both published and private, it seems quite evident that all or nearly all of us have missed the same boat on the occlusion, harmony, balance, symmetry, beauty, art, and permanence of results described in a chapter of Angle's seventh edition. About eight years ago I realized this and became frantic. As I re-read Dr. Angle's classic essay on "The Mill" I was

impressed by these words about the dental apparatus: "To be considered as a machine from start to finish, operating on mechanical principles," etc.

I recalled that in artificial denture work the teeth must be placed on the ridge if the denture is to be successful. With this fact in mind, I began to check the placement of the teeth in the children of my practice. I found that, as a rule, where beauty, harmony, symmetry, balance, and permanence of result had been achieved, the lower incisor teeth were on the ridge or basal bone. For years afterward, whenever I saw in a face the qualities that indicated such a position of the teeth, I tried to find an opportunity to examine the lower incisors in relation to their bony bases. In an overwhelming proportion of cases I have found these teeth to be up on the basal bone. Gradually I have felt compelled to accept this phenomenon as a guide in diagnosis and treatment, instead of depending entirely upon the position of the cusps and upon occlusal relationships.

It is generally agreed that in most cases of a break in the continuity of either of the dental arches, by loss of a tooth or parts of a tooth, or of an overlapping of contact points, the teeth posterior to the loss of contact drift mesially; and also, that if the restraining influence of the orbicularis oris is deficient, the whole denture sometimes drifts mesially.

In the past orthodontists have accepted the position of the mandibular teeth as a guide in occluding the maxillary teeth, regardless of the relation of the mandibular teeth to their bony bases; though this relation is in most cases, and especially in Class I, Class II, and bimaxillary protrusion types of malocclusion, as far from normal as the corresponding relation in the maxillary teeth.

We are prone to disregard these important factors, particularly in the mandibular arch. We correct only irregularities and rotations. Apparently without much thought of first correcting the relation of the mandibular teeth to their bony bases, we proceed to use these malpositioned teeth for anchorage. To make matters worse, in correcting irregularities and rotations in the mandibular arch, we usually displace the lower anterior teeth, causing a greater protrusion. Then we proceed to articulate the maxillary teeth to the mandibular teeth. To expect lasting and satisfying results from such treatment is futile. If favorable growth and development factors did not sometimes come to the rescue of young patients and the orthodontist, the percentage of successfully treated cases would be lower than it is.

Most uncorrected malocclusions ultimately come to a functional mechanical balance. They do not grow progressively worse throughout life, or, at least, not rapidly. There is a natural compensating adjustment of all factors pertaining to the malocclusion, and the teeth adjust themselves in accordance with the existing balance of forces, and maintain themselves almost constantly in these positions throughout the life of the denture.

When such irregularities occur in the anterior region of the mandibular dental arch they should be carefully studied, particularly in older patients. Experience has taught me that the arc which will most closely approximate the incisal edges of the malpositioned six lower mandibular teeth, particularly in Class I cases, is nearest the functional mechanical balance point. To move the incisors mesially to this point is to throw them into protrusion and invite failure in our efforts. We must move the teeth in the buccal segments of the

mandibular arch distally to allow an adjustment of the lower incisors without disturbing their normal mesio-distal positions of functional mechanical balance.

It is evident that most orthodontists believe that if they establish a reasonably satisfactory cuspal relationship, regardless of axial inclination or the relation of teeth to their respective bony bases, occlusion will invariably direct the growth processes so that the maxillary and mandibular base bones will themselves grow forward and under the mesially positioned teeth. I wish this were true. If it were, would not orthodontics be the easiest and most satisfying of all specialties to practise, instead of being what it really is?

I have not found the practice of orthodontics so simple as that. I waited for years for the stimulation of occlusion to develop bases under the protrusive dentures of some of my patients, and in most of these cases I am still waiting. The fact of the matter is, I have come to the conclusion that in many cases our treatment has retarded rather than stimulated growth and development processes. Let me emphasize again that unless we first establish a normal relation of the mandibular teeth to the mandibular base and *keep that relation throughout treatment*, our efforts will result only in substituting one malocclusion for another. That is to say, our sole procedure will have been tooth alignment rather than basic treatment.

Only after the mandibular teeth have been moved to normal positions with relation to their mandibular base and kept in that relation during treatment can they be used as a basis for positioning the maxillary teeth in the treatment of malocclusions.

This phase of treatment which has to do with the correct positioning of mandibular teeth to their bony bases I have chosen to call anchorage preparation. In my opinion, such a procedure should be the first step in the treatment of all malocclusions. My reasons for believing so are as follows:

1. I now obtain infinitely better balance, harmony, symmetry, and beauty in the faces of my patients than I formerly did.
2. The dentures of my patients are more stable and the percentage of successful treatments has increased 100 per cent.
3. Macroscopically, the proportion of root resorptions in my practice has decreased at least 50 per cent.
4. Gum recessions are rarely encountered.
5. During the past four and a half years I have not, to my knowledge, devitalized a single tooth, whereas during the previous nine years I had encountered eleven such mishaps. In fairness to my former methods I must say that with one exception all eleven devitalized teeth had a history of previous injury.
6. The research that my brother, Dr. William Tweed, and I are doing—that is, completing the records of all our former cases—seems to substantiate fully our contention that in orthodontic treatment the mandibular incisors *must be placed upon the basal bone*.

Two years ago we decided upon this research project in the hope that it would throw some light on the problems then confronting us. We made a list of all the patients I have treated to date—approximately five hundred. One hundred and fifty of these cases have been retained during the past three years. The other 350 have been out of retention from two to ten years.

Our endeavor is to contact as many as possible of these 350 cases, and we have set our minimum goal at 75 per cent. To date we have secured models and photographs, and X-rays when possible, of 164 cases, which leaves 176 to be located. For their generous help, we wish publicly to thank Dr. Cecil C. Steiner, Dr. Hays Nance, and others who have aided us in securing these records.

I list some of the information we seek:

1. Of our fully completed cases, what percentage are free from serious relapse, the teeth in good functional occlusion and the investing tissues reasonably healthy?
2. Is the line of occlusion synonymous with balance, symmetry, harmony, beauty, and art as related to the face, and to permanence of tooth position in the denture? At present we most certainly think so.
3. Does the length of time of treatment have a bearing upon the extent of root resorption? Macroscopically, we seldom detect root resorption prior to the fifth to seventh month, and its extent appears to be in direct ratio to the length of treatment. Age also seems to be an important factor, for extensive resorption seems more likely to appear in older patients.
4. How does the extent of root resorption and gum recession during the first six and a half years of my practice, when the arch wires were made of gold and when all the tooth movements were simultaneous, compare with those of the last six and a half years, when the arch wires were made of steel and the treatment was that I now advocate?<sup>1</sup>
5. In which patients—those who are underweight, of average weight, or overweight—is root resorption more likely to appear? Our finding is that overweight children and children with Class III malocclusions suffer most, while as far as we can determine there is little difference between underweight patients and those of average weight.
6. Do treated bimaxillary protrusion cases stand the test of time in the same ratio as cases in which the treatment is that we advocate—when the mandibular teeth are placed on the ridge? The answer to date is definitely no, though in some cases there is no relapse.
7. Does placing the mandibular teeth upon the ridge in proper relation to their mandibular base have a bearing upon balance, harmony, beauty, and art as related to the face, and to permanence of tooth position in the dental apparatus? Decidedly yes, in 90 per cent or more of our cases. There are occasional exceptions, however.

As to type, we think it better to creep before we try to walk, and we are therefore learning to straighten teeth before we attempt to deal with this question. Moreover, we do not approve of some of the orthodontic types we have seen produced. We believe there is little likelihood of setting the denture too posteriorly in relation to head structure, and that if we should err in this direction function would drive the denture forward, creating the correct type in the individual. However, we believe that ordinarily it is impossible for function to make such a correction when our treatment has left the denture in protrusion. Rather, in such a case we

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<sup>1</sup> This method is described in my second paper.

expect collapse and failure in the lower incisor region as nature endeavors to bring the denture back to functional mechanical balance.

If through the results of our investigation we can more surely serve our patients in achieving balance, symmetry, harmony, beauty, and art in relation to the face, and assure them of more nearly permanent results, we shall then be continuing the inspiring tradition that Dr. Angle bequeathed to us and the profession.

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