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*A magazine established by the co-workers of
Edward H. Angle, in his memory.*

The Rationale of the Angle Principles of Treatment for Cases of Malocclusion in Class II, Division I.*

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The marked similarities between cases of malocclusion of the teeth of Class II, Division I, (Angle Classification) are well known to orthodontists. Not only are the distinguishing characteristics of these cases more constant than those of other classes and divisions of malocclusion, but their striking similarity in dental and facial deformity is so remarkable as strongly to suggest a common cause for cases coming under this classification. However, no one cause has yet been singled out as alone responsible for the condition, but several abnormalities, any one of which might have operated to produce it, are usually present in every case. The more usual of these, of course, are mouth-breathing, faulty musculature, such as abnormal lip habits, faulty swallowing, faulty sleeping postures, etc., etc. But whatever the cause or causes, the resulting perversions are constant, characteristic and remarkably similar, a fact which proves beyond question that while the forces of growth and development have been perverted, the same *laws* of development operate in the same manner in all cases; in other words, the forces that under normal conditions produce normal occlusion, are, in these cases, disturbed in so specific a manner as always to produce

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a specific form of malocclusion. This is not to say that there is no variation in the picture these cases present but that material variations are rare and that a marked variation would automatically take the case out of this division of this class.

It follows, therefore, that a specific method of treatment which would fully and permanently reestablish the normality of the governing forces in one of these cases, would do it in all, and that thereafter the development of the affected parts, if not attaining to full normality, would at least be continuously in the direction of the normal.



Figure 1

Casts of Class II, Division I malocclusion before treatment.

So much and such varied treatment of so many cases of this division of this class has been reviewed in orthodontic literature and the degrees of success attained have been showed to be so different, it would seem that attention had largely been centered on causes or symptoms rather than on underlying principles. Hence it would further seem that a form of treatment founded on such principles that the operator could be assured that the artificial mechanical forces evolving therefrom would be as certain and as uniform in regaining normal occlusion as the perverted natural forces had been in previously establishing the malocclusion, and as applicable to one case as to another of this division, would meet with general favor. Especially should this be true in view of the fact that such a form of treatment, herein to be outlined, *has* met with such unusual success in the hands of so large a number of orthodontists as to seem to have thoroughly established its merit.

Dr. Noyes says: "The way in which these teeth, the first permanent molars lock, determines the balance between the forces produced by the action of the muscles attached in the region of the ramus and those in the region of the symphysis." Let me state this a little differently. The

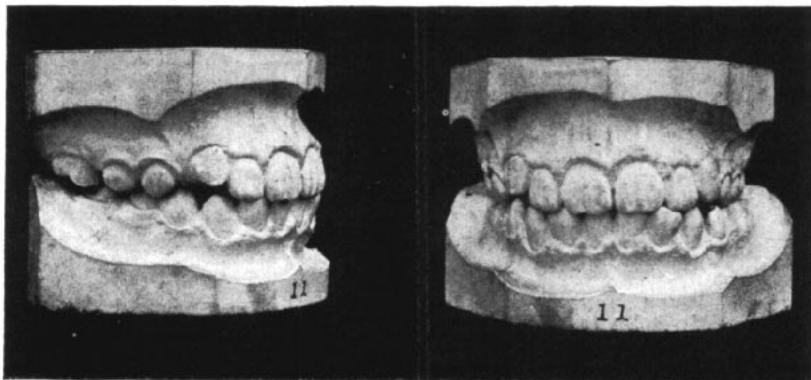


Figure 2

After eight months of active treatment.

way in which these teeth lock determines whether the forces of occlusion will be delivered to the jaw bones as helpful forces in effecting their correct development or as harmful forces in effecting their incorrect development. It is around this statement that this paper and the treatment which it sets forth, is written.

In considering the development of the normal denture we are inclined to underestimate the extent to which the upper teeth, particularly the first permanent molars, striking on the distal halves of the lower first permanent molars, carry or develop the lower jaw forward normally; also to forget that if these teeth are incorrectly locked, the influence is equally powerful to produce the wrong development of the jaws,—the abnormal.

We may judge that the maxillary bones, up to the floor of the orbit, are chiefly constructed for the support of the teeth and that they are subserviant to the teeth. When the teeth are in malocclusion, therefore, we may expect to find all of this portion of the bone affected by the malocclusion and I doubt not that its influence goes further.

In the maxillae, as in the mandible, growth takes place by addition to the surface of the bones; a forward development by addition in the molar region and a downward development by the enlargement of the sinuses, the molar teeth playing an important part in the development. Let us consider why.

It will be remembered that each successive upper molar forms distally and slightly buccally to the one which precedes it in development, its occlusal surface facing backward and slightly outward. As it erupts it swings downward and forward until it meets its antagonist in the opposite jaw. When correctly antagonized, the force of occlusion from the opposing lower tooth is received upon its anterior half which tends not only to erect the upper tooth but to carry growth stimulus to the maxilla in the direction in which normal development should take place. When this is completed and the tooth is carried to its correct final position, it is maintained in this position by and because of the balance of all of the combined natural forces that act upon it.

The lower molars are formed with their occlusal surfaces facing anteriorly and slightly inwardly. As they swing up into place and become correctly antagonized they receive the weight of occlusion upon their distal halves, which tends to erect them. This, by throwing the roots forward like a lever, necessarily stimulates development of the mandible in a downward and forward direction, just as we would wish it.

Let it be remembered, however, that these teeth are sustained in correct balanced relationship not only by the force of occlusion, but by all of the forces of the denture that act upon them. For instance, in their normal position they are not perfectly upright, and if they were not held back by the forces from the lips, (especially the lower lip) acting through the contact of the teeth anterior to them, they would migrate mesially.

I would like to have you form a vivid mental picture of this, for it is an important consideration. As Dr. Noyes has told us, everything about the denture seems to operate to carry the teeth and jaws forward and outward. The positions of the developing teeth in their crypts, the inclinations of the erupted teeth in the denture, the action of the tongue, the direction of the impact on closure of the jaws, etc., under normal conditions. All of these forces are antagonized in front by opposing forces derived from the wall of muscles in the lips and cheeks. Between this forward movement tendency and the resistant backward forces, there is established, under normal conditions, a stable equilibrium at a series of definite points which we call the line of occlusion—a line with which all the forces of the denture, from whatever direction, balance. Obviously, so long as conditions remain normal, the forces will remain balanced,—normal occlusion will be maintained. On the other hand, if the teeth of either arch erupt into positions that are anterior to their normal location in this line and thus encroach upon the wall of muscles, namely, the lips, the pressure upon them must be excessive. Consequently the arches, with their teeth in regular alignment, must either move distally, intact, to find the point

of equilibrium or the arch form must crumble and the teeth assume irregular positions. Because the tendency of the posterior teeth to move forward is generally sufficient to resist a backward migration of the anterior teeth, the arches usually crumble in the incisor or cuspid region.

On the other hand, if the teeth assume positions in their respective arches that are distally to their normal positions in the line of occlusion, the force from pressure of the lips is naturally decreased and the natural tendency of the teeth to move forward is, if anything, increased. Why,



Figure 3
Patient before treatment. Age 10.

then, would not these teeth move forward until the pressure exerted upon them by the lips was normal; until equilibrium was reestablished; in other words, until they find their normal positions in their respective arches in the line of occlusion?

Let us consider a typical case belonging to Class II, Division I, in which the lower permanent teeth erupt into and lock in positions of distal occlusion with their antagonists, and see how it develops.

Upon the eruption of the first permanent molars, from some unnatural cause, instead of the proper inclined planes of these teeth antagonizing each other, the improper planes approximate. Instead of the big mesio-lingual cusp of the upper first molar being guided back into the central fossa of the lower first molar, it is guided ahead and the disto-lingual cusp takes its place in the fossa. To accomplish this, the upper molars must have been driven ahead of their proper position and the lowers held back. Each time the jaw is closed, the impact, instead of being a balancing force as it should be, drives the upper molars forward and they in turn drive all the teeth

anterior to them forward. The lower molars, instead of being erected as they should be, thus hinging or prying the mandible forward, are constantly driven downward and backward.

During this time the upper lip has not developed, because of disuse, and the lower lip is habitually held beneath and lingually to the upper anterior teeth instead of closing over them, as it should do normally. Therefore, instead of restraining a forward movement of the maxillary teeth, it augments such movement. The case now presents a full, overprominent maxilla, with a small mandible and weak chin. The point of the chin is



Figure 4
After eight months of active treatment

clearly not far enough forward, but why? Is it because the body of the mandible is shortened? Is it because the angle of the ramus is too acute or the neck of the condyle bent? Or is it because the temporo-mandibular articulation is located too far distally? Probably several of these factors enter into the condition, but I do not believe that the temporo-mandibular joint has changed much, if any, in position, or in its relation to the skull. I would ask you to look at a skull and see how beautifully these parts are placed and braced, before you take exception to this statement. I doubt not, however, that the articular surfaces and the articular cartilages may have changed somewhat to accommodate themselves to the abnormalities of jaws and musculature.

Now, if it be granted that the temporo-mandibular articulations are normal and have not changed position in relation to the skull, is it not a wrong principle in treatment to protrude the mandible and draw the condyles forward in the glenoid fossae in order to accomplish what is ob-

viously necessary—the bringing forward of the point of the chin? How, under such circumstances, could we expect the muscles to act normally when we have thus changed the direction of their pull by carrying the bone forward and with it, their points of attachment?

If, in our treatment, we bring the mandible forward until the occlusal relations of the buccal teeth are normal, place upon the teeth a retainer that will guide the jaw to that position on closure, and then instruct our patient



Figure 5
Three years after treatment was completed.

to hold the mandible forward in that position, let us see what the result would be. The two most important muscles brought into play to accomplish this would be the pterygoids, chiefly, the external pterygoids which are attached to the anterior border of the neck of each condyle and pull forward and slightly inward. It would seem to me that this very act of protruding the mandible would defeat our ultimate objective in treatment. Why?

We understand that the mandible, in its natural position with the condyles in the anterior section of the glenoid fossae, is swung by the muscles of mastication much as a cradle swings. If we protrude the mandible by mechanical means and bring the muscles of mastication into play with the mandible in this position and the teeth of the upper jaw fixed by means of a plate so that they cannot be “dragged” distally, are we not in grave danger of dragging the teeth of the mandible forward; of producing double protrusion—a condition far worse than the one with which we started?

How then are we to accomplish our aim? I believe we will find the answer in the story of natural development.

I am thoroughly convinced that we cannot, in six weeks or six months time, correct by artificial means, a condition which has existed and grown continually worse for years. I doubt if we could ever do it by artificial means. Neither do I believe it to be necessary. I do believe it necessary however, to put nature's forces to working normally and to keep them working.

It is my understanding that the mandible ceases to develop at or soon after the time it is deprived of its developing influences. Remember what Dr. Angle told you about classifying from a point of development?

In these cases, then, we have a mandible of eight year old development, we will say, in a twelve year old child. Why not put the teeth of this child of twelve back into harmony with the line of occlusion for a child of eight and let nature bring the development down to date? This means putting the upper teeth back into harmony with the normal tempero-mandibular articulation,—in other words, leaving the mandible where it is and carrying the upper teeth back until the occlusal relations of the molars are normal.

In these positions the lower first permanent molars will be in correct relationship to the mandible in its then shortened condition. The upper first permanent molars will be in correct relation to the lower first permanent molars but distal to their correct position in the maxillae. All four first permanent molars will be in their correct relative positions to the rest of the skull that they should normally have occupied at the age of eight but distally to the positions they should now occupy at their present age of 12 years. If you doubt that they will come forward (again, bringing the lowers with them) think how many times you have seen teeth in *double retrusion*. Never!

Our principal problem, then, in the treatment of this type of mal-occlusion is the conservation of anchorage for the purpose of moving all of the upper teeth distally without displacing the lower teeth forward in the mandible. With the old types of appliances this must have been very difficult. With the "E" arch, for instance, it was possible to get stationary anchorage of the molars only. We have been fortunate in having the ribbon arch which gave us much better force control and stationary anchorage on all teeth if properly applied. With the advent of Dr. Angle's new, side entrance, bracket appliance a still finer force control is possible. As the technique of treatment of Class II is dealt with in another paper, I shall not here go into the detail of it.

Now let us try to visualize what happens during treatment after this plan. As stated before, I believe that the upper teeth should be carried

back (distally) until their normal occlusal relations with the lowers have been established, the condyles occupying their normal positions in the glenoid fossae. How are we to know when this has been accomplished? How often have you treated Class II cases and found, at the conclusion of treatment, that the patient could no longer pull the lower jaw back to a position where the mandibular molars were not in normal cusp relations with the maxillary, and then discovered, a few weeks later, that he was again able to slide it back almost, if not quite, to its original cusp relationship?

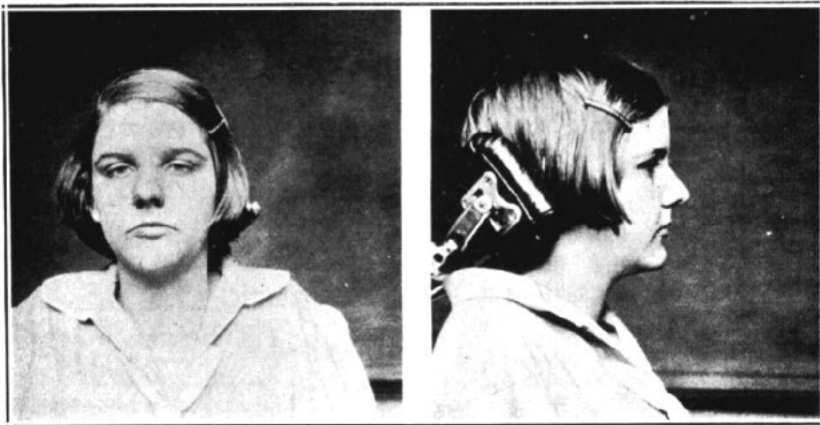


Figure 6
Six years after active treatment.

What has taken place in such a case? In spite of our best efforts at obtaining anchorage in the lower jaw, the lower teeth have been inevitably dragged forward to some degree in the mandible. The mandible itself may be somewhat elongated from the constant pull of the rubber ligaments of the temporo-mandibular joint so that there is a temporary, if not a permanent change, brought about which seems, for the time being, to prevent the patient from voluntarily carrying back the mandible to its original position.

When the rubber ligatures are discontinued it may be expected that such temporary changes will relapse; in fact, it is our hope that they will. Any movement forward of the mandibular teeth in the mandible itself, we hope will relapse when these teeth are released. Certainly it is our desire that the distortion of the temporo-mandibular articulation, as a result of the pull of the elastics, will disappear.

If these changes are bound to take place after active treatment has been discontinued, it is obvious that the teeth must not only be brought into normal occlusion during treatment but must even be carried *beyond their normal occlusal relation* far enough to compensate for the changes just mentioned. Then when the relapse has occurred, they will still be found in normal relationship to each other. In other words, a Class II, Division 1 malocclusion must be treated in such manner that during treatment the teeth must not only be brought into a Class I occlusal relationship but must be carried on, beyond, and far enough into a Class III occlusal



Figure 7
Ten years after active treatment.

relationship to equalize the relapse of the unavoidable temporary changes in the tissues that occur during the treatment.

This raises the question as to how we are to know how much we have displaced the mandible forward, how much we have lengthened it and how much we have carried the maxillary teeth backward? How shall we be governed in this overtreatment of our Class II, Division 1 cases? The answer, of course, is just to the degree that the mandible and the mandibular teeth will relapse after the intermaxillary rubbers have been removed. We must remember that to gage the distal movement of the upper teeth by the cuspal relationships to the lower ones is very inaccurate. It would be far better if we could establish a fixed surveying point from which we could judge this distal movement and then carry the upper teeth backward the required distance regardless of the ever changing position of the mandible.

Distinction should here be drawn between distal bodily movement and

the distal tipping of these maxillary teeth, for even though the cuspal relations of the teeth, one to the other, may be correct, *unless the axial relationships of these teeth are also correct we cannot have a permanent normal occlusion*, for as these teeth right themselves under the stresses of occlusion, either the cusps and incisal edges will come forward, to bring about this correction, or the cusps must be held in a normal relationship until the roots and crowns are carried back. Therefore until the axial correction is fully accomplished, the teeth cannot and will not remain stationary. There must be a balance of forces established about them before this can be hoped for.

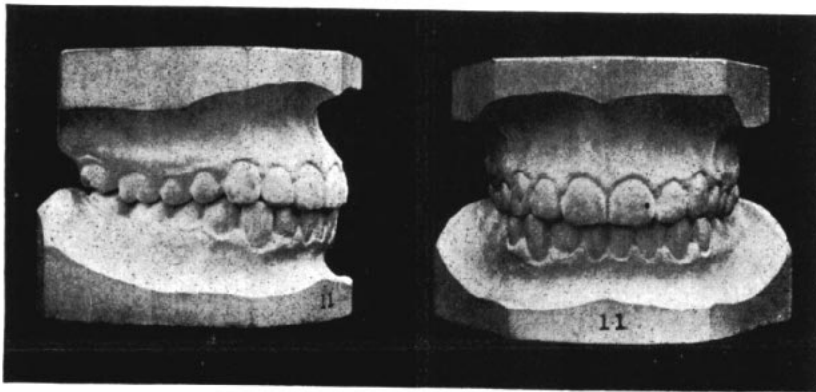


Figure 8
Ten years after active treatment.

During retention, after the treatment here indicated, it is our desire to maintain the teeth in normal cuspal relationship to each other until they will remain there unassisted. Our purpose should be only to antagonize those teeth that have tendencies to return to their original position of malocclusion. I know of no better means of doing this than by the use of the upper Kingsley plate and the intermaxillary inclined plane, wherever possible.

During the period of retention the forces of occlusion act to further correct the axial inclinations of the teeth, through the axial stress brought to bear upon them, and to further interdigitate and interlock the cusps when the jaws are closed.

It will be remembered that, by virtue of the treatment here outlined, all of the teeth are now being retained *distal* to their proper relationship to the skull. That they will all again come forward, during the period of retention and in the years succeeding, bringing with them the shortened mandible, I believe the pictures herein shown, fully attest. (Figures 1 to 8.)