Why Is Normal Occlusion of the Teeth the Exception and Not the Rule?*

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The prevention of malocclusion is a topic that you are all vitally interested in, I am sure, and I wish that I could unfold to you a group of facts that would make you powerful agents in combating abnormalities in tooth and denture position. To be honest, however, I must state very positively that I cannot do this. Comparatively few cases of malocclusion can be prevented because there is still too little known about the intricate mechanisms associated with the phenomena of heredity, growth and development. I am firmly convinced that the primary causes of most of our cases of malocclusion date back to the early months of babyhood and many of them are established at the time of cell fertilization. The longer that I practice orthodontia, the more I am convinced that the present-day child is a victim of poor breeding and that the orthodontist's work is made necessary because of this handicap. The medical and dental professions, with their many specialties, are in existence today for the main object of doing their best to evolve and maintain normal individuals who are in a constant fight against their tissue defects. We are paying the penalty for being too civilized. Nature, in the raw, kills off her weaklings, and the species is maintained through the strong and healthy members who survive in this death struggle of the primitives. Civilization nurtures the weak, spares the unfit, and so physical and nervous stamina has degenerated.

Unfortunately for the orthodontist, it is nervous unbalance that counts so much in the etiological side of his problems. Malocclusion is pre-eminently the result of a lack of balance. In order to understand what I mean let us study a few slides. You are all very familiar with this picture of normal occlusion. You know just what relationship each tooth and every inclined plane on each tooth should bear to one another in order to be in normal relationship.

This, we may designate as a *static* conception of normal occlusion. I wonder if anyone has ever presented to you the dynamic or the force conception of normal occlusion? That is what I would like to discuss with you tonight and then I am sure you will have a better idea of just why nature has such a difficult task to produce and maintain the normal.

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The first force that we think of in connection with the denture is that of mastication. Now the pounding of the lower denture against the upper, by virtue of the activity of the muscles of mastication, is not a straight up-and-down force but is a force that is disseminated in segments of circles, because the lower jaw moves on the lines of a curve, pivoting in the tempero-mandibular articultion. The teeth are adjusted, in their alveolar processes, to best resist these curved lines of force. That is also why we so often have a slight distal curve at the ends of the tooth roots. When the vertical adjustment of the teeth conforms to these curved lines, we note that the crowns of the incisor teeth are slightly labially located to their roots, while the crowns of the canines, premolar and molar teeth are somewhat mesially placed in relation to the apical ends of their roots.

In such an arrangement, the occlusal surfaces of the lower incisors must meet the lingual surfaces of the upper incisors at an angle, while the occlusal surfaces of the lower canines, premolars and molars must assume a similar angular adjustment to the upper canines, premolars and molars. These angles all point forward so that every time the jaws are brought into contact there is a forward propelling force exerted upon the teeth and they have a constant tendency to move forward in the jaws. This force, Dr. Angle called the anterior component force. It is due to this tendency that the spaces, where teeth have been removed, tend to close up.

The object of this force is to maintain the teeth in close proximal contact and to aid in the forward and lateral growth of the jaws which should normally take place. The reason that the teeth finally stop going forward and eventually remain in definite relationship to the skull is due to the counter force, in a backward direction, that is exerted by the musculature of the lips, aided by the attachments of the cheek muscles.

Everything works out finely as long as these various opposing forces are balanced. Naturally the blows struck by the occlusal forces are supposed to be perfectly resisted by the strength of the bone that forms the alveolar processes and that of the basal bones upon which these processes are built. But suppose, for some reason or another, the composition of these resisting bones is not up to par. Their mineralization is faulty. Then we see signs of closed bite. The molars do not rise to a correct height. The lower incisors begin to strike the gum behind the upper incisors. This may be manifested as early as three or four years of age. The best that we can do is to treat this symptom by placing a so-called bite plate in the mouth. This is a plate having a thickened mass of rubber behind the upper incisors upon which the lower incisors strike, thus taking the strain off from the molar

teeth and permitting them to erupt to their correct vertical height. But how to overcome the *primary* defect in the bony tissue is another matter. We can feed the child food that has a high content of mineral salts therein and we can give him cod liver oil or other similar products. Sometimes these help and sometimes they do not. Correct vitamin content in the food, especially vitamins A and D, are of extreme importance, too. But in many cases this does not do a bit of good. In these cases there is something radically wrong in the metabolic processes of the child which prevents the assimilation of the materials that go to build strong, healthy bony tissues. It may be a fault in the endocrine mechanism, but at the present time its treatment is baffling and we are simply helpless.

In such cases we are also apt to find a decided lack of stability in the motor nervous mechanisms of the child. These children are full of muscular tics, spasms and habits. Frequently they have eczema or other skin blemishes. Their alveolar processes are often large and bulky, an effort of nature's to resist tooth-displacement by building bulky tissues because she cannot build strong ones. These defects in the metabolic processes are, I believe, often manifestations of hereditary faults. So much then for faulty mineralization of the bony bases and supporting osseus structures of the denture.

The next force in dynamic occlusion that we will discuss is that of the muscles. There are two groups of muscles that interest us. Those of mastication, which move the mandible upward against the maxillary base and those that are environmental to the denture and support it laterally and anteriorly, are active in expressing mental states and are used in swallowing.

The muscles of mastication may be too weak, because they are not thrown into powerful action, due to the fact that soft foods are too much in evidence, or they may be hyperactive. Lack of use is apt to retard the growth of the jawbones because the stimulation of normal functional forces is a powerful factor in evolving correct size in bony structures. If they are over-active or active in a perverted manner, they sometimes bunch themselves behind the last molar teeth and force these teeth and, in turn, through proximal contact, all the teeth of the dental arches too far forward.

The environmental muscles are exceedingly important in establishing force balance in dynamic occlusion. They are the muscles that control the anterior component force that we have just discussed. They should be so adjusted as to permit the normal forward movement of the teeth during the period of jaw growth and then should check this forward movement at just the right time and thereafter balance themselves perfectly against the forward force so as to maintain the teeth and denture in the correct permanent relationship to the skull. They should also properly balance the pressure of the

tongue that is active on the lingual side of the tooth arches. Hence their activity is probably the most important of all the environmental forces that are associated with the denture.

Now let us discuss the various nervous phenomena that produce an unbalancing of these muscles that are environmental to the dental arches. Thumb sucking has been brought to your attention many times and most mothers are on the watch to check this habit. Why do babies so often fall into this habit? It has always seemed to me to be the natural expression of a lack of some building material that the tissues crave and are not getting enough of. This does not necessarily mean that this substance or substances are not in the food but again the system may not be able to assimilate it from the perfect diet or prepare it properly for cellular consumption because of an unbalance in the metabolic cycle. The craving of the forming tissues is reflected in nervous reactions and the sucking function is stimulated beyond normal. Let us remember that even if the thumb or fingers are denied to the child there still remains the lower lip or possibly the tongue and many of these children transfer their actions from thumb to lip and the effect upon the dental arches is quite in evidence.

Not all thumb and finger or lip suckers have malocclusion. A certain percentage escape, either because they counteract the effect of the abnormal sucking by other muscular habits that fortunately act in a corrective manner or they may have sufficiently strong bony structures to bear up well against the excessive muscular strain.

Although, as the child grows older, these sucking habits are dropped to a certain extent, they are far too frequently incorporated into the function of swallowing and upset the muscular balance of this normally stimulating activity. In the first stage of the swallowing act, a vacuum is formed within the mouth in an effort to draw liquids and the food bolus toward the base of the tongue. The muscles that form this vacuum are the same that are active in the sucking function. Consequently these unbalanced children greatly exaggerate this muscular action so that the lip tissues and soft tissues overlying the chin, where the mentales muscles are attached, are thrown into knotted and protruding areas that indicate powerful actions of the muscle fibers. This being done hundreds of times daily acts as a check to jaw growth by pressing upon the teeth and basal bones. The dental arches collapse, the teeth overlap and malocclusion is established.

Sometimes we find an exaggerated anterior propelling force working against an equally exaggerated posterior force. This produces the most complicated of all the malocclusions that we have to deal with. It is characterized by a forward positioning of the buccal segments of both upper and

lower dentures. In cases of this kind, we usually find a different condition in the environmental muscles than that of excessive and perverted action. If you take hold of these tissues and try to stretch them you will notice that they are tense and resistant. They may be characterized as "boardlike," instead of flexible as ordinary tissues should be. Such muscles are said to be hypertoned.

All muscles exist in a certain state of tonicity. It is a condition, due to the action of the nervous control of the muscles, whereby these structures are ready at all times to respond to the stimulating messages calling for their action. Under certain unbalanced states we find muscle tone too tense and then they are said to be in a state of hypertonicity. At other times we find these structures too flaccid and this condition is called hypotonicity. Both of these abnormal conditions in the tone of muscles are quite apt to result in some form of malocclusion. Hypertonicity produces excessive pressure and resistance; hypotonicity fails to give proper support against denture forces that normally should be resisted. The cause or causes of these muscular abnormalities are systemic and not local and are apparently deep-seated in unbalanced metabolic processes or are hereditary tendencies that have made themselves manifest. So again are we baffled in our efforts to remove such conditions in time to prevent their faulty actions or to eliminate them as part of our treatment of the deformities that they have produced. We try to relieve their local effects by the use of exercises, but it would be far more beneficial and satisfactory if we could deal directly with the primary condition that was the original cause of these muscular abnormalities.

I certainly hope that I have not confused you with a group of new factors that will be hazy memories in a day or two. Lest this be the case, let me summarize our little talk with a few concise words.

First: The prevention of malocclusion is generally negative in effect because:

(a) There are powerful influences from hereditary tendencies that work to produce tissue defects.

(b) Metabolic processes are frequently at fault.

(c) Endocrine unbalance is quite prevalent.

Second: Normal occlusion of the teeth is a dynamic and not a static composite.

Third: A dynamic organism requires perfect balance in its various composite forces in order to evolve harmoniously and maintain perfection and equilibrium in its various component parts.

Fourth: The primary cause of perverted force action or resistance must be known and thoroughly understood before the perversions can be prevented and their effects entirely overcome.

In closing, let me state most emphatically that even though the picture of prevention is painted in very dark colors, yet this does not lessen our responsibility toward doing all that we can to solve this problem and also to continue zealously those efforts in the field of prevention that are beneficial. We must still teach and preach the gospel of the preservation of deciduous teeth and permanent teeth; of breast feeding rather than bottle feeding; of the use of a well-balanced diet in early childhood; of cod liver oil and calcium salts; of plenty of vitamins A and D; of chewing hard, fibrous foods; of preventing and overcoming sucking habits and mouth breathing; of reducing the nervous tension in children by not overtaxing them with too many burdensome activities out of school hours; and of making abundant use of the benefits of fresh air, sunshine and exercise. There is plenty for you to teach in the line of prevention and it will be helpful and worthwhile, but do not make positive statements concerning results. We have not reached that stage of perfection in prevention as yet!

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