The Individual in Orthodontics

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INTRODUCTION

The purpose of this paper is to reorient our thinking and concepts regarding the etiology of malocclusion. Orthodontists have fallen into the habit of approaching the problems of malocclusion from the anatomical standpoint rather than from the physiological one. This is evidenced by the fact that most of us know more about, and spend more time on, the correction of the anatomical defect than upon the consideration of the etiology and prophylaxis of malocclusion. The emphasis has been on the anatomical findings rather than upon physiological factors.

We have always been taught, even as far back as freshmen in dental school, that bilateral symmetry is true phylogenetically of most living organisms, including man. I contend that this is not always so. In fact, all you need do is look at the person sitting next to you—or better yet, shake both of his hands—one is stronger or larger than the other. There is a dominance of one side. In fact, this dominance has been predetermined at cell level through evolutionary processes, which have changed primitive undifferentiated protoplasm into complex cytoplasm involving gradients and centers of activity.

ETIOLOGICAL CONCEPTS

My thesis shall be considered from two main aspects. First, the etiological concept, and second, the biological concept of malocclusion. Furthermore, I shall try to show how these two concepts are fundamentally interrelated.

Most textbooks discussing the etiology of malocclusion list a number of causes. These include fingersucking, lip biting, poor sleeping habits, anomalies of eruption, disturbances in growth pattern, allergy, endocrine factors, and emotional effects. I propose to discuss the last three at some length because I believe they are very closely related to one another and very pertinent to the explanation of the other mentioned causes.

One must consider the dynamics involved in order to appreciate the "why", rather than the "what", in dento-facial configuration. Although the end result, anatomical deformity, is important and must be treated, the physiological influences which have brought about the anatomical change, are of more import. Not until we begin to include all of the causative factors in our understanding of the total orthodontic problem, are we as orthodontists going to achieve our ultimate objective.

Since 1937 I have gradually been placing greater emphasis on a history of allergy in children when they first present themselves for orthodontic examination. Now, questions concerning allergy are an important and routine part of my examination. Nasal smears may be made to corroborate the clinical impression of allergy; however, it is not really necessary to prepare slides, though the technique is really quite simple. Proper questioning of the past medical history will nearly always supply the desired information.

Balyeat and Bowen (1934) examined

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the palatal vaults of children who had been classified as (1) nasal allergy, (2) disabled, (3) White, (4) Indian, and (5) Negro. The number of V shaped vaults found was nearly five times greater in the nasal allergy group than in any of the others. The instance in each group per 100 children was 24, 5, 7, 4, 4, respectively.

Allergy seems a factor of magnitude in the treatment of malocclusion. A high percentage of malocclusion patients are treated by the allergist and the orthodontist. The allergist often is the first to detect the malocclusion. The orthodontist often precipitates the treatmen by the allergist. It has been my observation that patients who have seasonal sensitivity respond very poorly in their orthodontic response during the pollen season; that those who discontinue allergy treatment slow down; and those who fail to respond to allergic management frequently have accompanying unsatisfactory orthodontic results. In view of these observations I feel, that when present, allergy causes some alteration in body function which contributes to orthodontic deformities.

There is one other facet of interest between allergy and orthodontics, and that is unilaterality. This frequently is seen in such allergic conditions as migraine, histamine cephalalgia, nasal edema, facial flushing and tearing. Allergic headache is occasionally unilateral. Incidentally, some allergists believe that identical twins often vary in their sensitivity and this is mentioned because of the problems created by interrelationship concerned with causation.

Functioning in the same manner is the consideration of the allergy-thyroid relationship. Current investigations are indicating that thyroid activity is often involved in certain allergic conditions. In addition to its affect on allergy, the thyroid as well as the other glands of internal secretion, plays a vital role in body physiology and pathology. The thyroid, parathyroid, and thymus glands have a common developmental origin. The function of the thymus is unknown, but much is known about the other two.

Horsley, as early as 1886, stated, "I find that the determining factor, par excellence, of the value of the thyroid gland as regards its influence on the general metabolic processes of the animal is age. Not only are the symptoms different, but similar symptoms vary in intensity according to age."

Perhaps the thyroid gland has received more investigation in reference to dental growth and development than any of the other glands of internal secretion. In fact, to return to allergy for the moment, Proetz, (1947-1950) stressed the importance of this gland to nasal allergy, and as mentioned before, the relationship of nasal obstruction and dental deformity is an accepted fact.

Wilkins, 1941, described a disturbance in the cartilage prior to its ossification in hypothyroid children. One result of this could very well account for a delay in ossification. Hunter and Sawin report, 1942, "An analysis of skull contour in thyroidectomized rabbits indicates the presence of different degrees of retardation in proportion to the rate of growth, both in bones preformed in cartilage and in membrane. The anomalies of the skull, teeth, and jaws arising under this condition are due to a general lowering of the physiologic activity which includes a restriction in the internal resorption of bone, and the normal growth of teeth."

Houssey and Hug, 1920, reported, "Retardation of dental development was observed in colts thyroidectomized at the age of two months."

Bodansky, Blair, and Jaffee, 1930, showed extensive resorption of cortical

and spongy bones following prolonged treatment with gradually increasing doses of parathyroid administered to guinea pigs. Sadhu and Brody, 1947, demonstrated that vitamin A in large doses reduced the weight of the thyroid gland and diminished the basal metabolic rate of rats. Richter reported that to withstand stress, wild rats in captivity show a "reduction in size of the adrenals and thyroids, and the increase in size of the pituitary glands." These findings are important because they show morphology can be changed by various stimuli.

Even prior to birth the effects of glandular alterations can leave their impact upon the fetus. This was demonstrated by Goldsmith, 1949, when he showed that the production of thyroid hormone could be inhibited in prenatal life. The newborn cretin rats continued to receive the anti-thyroid medication from the mother's milk, and later from their own diet. These rats grew at a definitely retarded rate, (64 grams at 84 days of age, instead of the control 160 gram weight). This finding is important because it indicates that glandular influences can be transmitted to offspring.

Simpson, 1924, removed the thyroid of one of sets of twin lambs, leaving the other as a control. Todd, 1938, reviewed Simpson's work and found when removal of the gland was in the first three or four weeks, marked stunting resulted and defective development of age characteristics resulted in both epiphyses and shaft. The shaft grew slower and the point of damage is "definitely in the diaphysio-epiphysial plane." The direct effect is a modification of growth velocity and the indirect effect is upon maturation. This finding is important because it indicates that all planes of growth are not affected equally. Von Eiselsberg, 1895, reported that goats that had their thyroid removed at 21 days of age increased in weight, decreased in growth, and that the extremities were more retarded than was the trunk. I cite this finding for it demonstrates that body systems as well as body parts present their own response pattern. This may explain why some children, who may have a subclinical hypothyroid condition manifested by a thick tongue, which is muscularly imbalanced, often produce spacing of the teeth, or an open bite.

Strong Emotions Make Strong Actions

Perhaps one of the most neglected fields in orthodontics is the sequelae of emotional disturbances. We have failed to recognize the underlying force with its malignant consequences in directly influencing dento-facial anatomy. We are failing to recognize the damage resulting from such habits as thumb and finger sucking, night grinding, lip biting, abnormal swallowing habits, etc. It should be obvious that these practices, when persisted in beyond the physiologic limits of the parts involved will produce varying and unwanted dental conditions. Often such problems go beyond the call of duty and the mere application of orthodontic principles, when situations arise that tax our patience and ingenuity in coping with these irascible youngsters. I'm sure you all know what I'm talking about! It is not the habit per se that is harmful; only when the critical point is passed does it become obnoxious. For this reason similar habits do not produce similar results in different individuals.

Most of these habits, some authors state up to 92%, arise from early psychological mishandling of the child. Children have early experiences associated with the mouth, so habits may begin early. Babies must develop the chewing habit. Someone has suggested that the infant should be allowed to

chew on the parent's fingers until such time as he bites the Hell out of you. This is nature's sign that chewing has been established as a habit. It is interesting to remember that one's first sense of security or feeling of well being is in the feeding and sucking process. We know the tongue is quite well advanced at the time of birth and the entire feeding mechanism is quite perfected as if by instinct. Not so well remembered, is the related fact that the clavicle is the first bone to form and the neck muscles are well advanced. Brodie's work, 1953, on the musculature involved in head balance and mouth opening indicates the correct function of this system. The infant utilizes a building block type of development. The muscles first used in eating and breathing are later used to give support to the head, (and still later to give balance to the trunk of the body). In any event, there is an early association between the muscles used in feeding and the loss of a sense of security. Threats to security during any period of life result in temporary regression and the child may return to early infant oral habits. The muscles used in expression, chewing, or swallowing may thus be stimulated in a manner normal for a younger age, but not when persisted in at a later age. A problem may thus arise when sustained improper usage develops. In this respect muscles are similar to many other protective devices which give cause for concern when the emergency pattern persists.

It is not within the scope of this paper to belabor psychological aspects of orthodontic care. Suffice to say, we should be aware of this situation, when it is present. Needless to say, these children, as well as the mother or parents, often should be referred to a psychiatrist or child guidance clinic through the pediatrician or family physician for more definitive therapy.

Biological Concepts

Much of what I shall now discuss is the crux of this paper. I propose to bring out some thought provoking ideas, none of which are particularly new or original, but have rarely been applied to our particular specialty. For some reason, which I fail to see, we have ignored the application of these facts. There isn't anything unusual about not utilizing knowledge available, in fact, there really isn't anything new under the sun, except the application of knowledge. We have much to learn from history, for history is forever trying to have us listen to its secrets and much of history will continue to come thundering down to us through long corridors in the future. I offer these concepts with the hope that they will prove to be a key to one of the doors of investigation, yet unopened.

At present, the most accepted measurements of facial development are based upon the assumption that one side of the face is the mirror image of the other, and all measurements have been based on the mid-sagittal plane. By definition, the mid-sagittal plane is based upon anatomy, being located equidistant from the two sides; this is a straight line. My contention is that there is another mid-sagittal plane based upon physiological dominance, which is often not equidistant from the two sides. There are four possible variants in this line: (1) it may be straight but to the right or left of the anatomical midline; (2) it may be oblique: (3) it may zigzag either on the right or left of the anatomical midline, and (4) it may zigzag to the right or left crossing the midline. By implication this automatically involves us in the vertical plane. These conclusions have been reached through studies of the dynamics of individualism and twinning as they apply to growth and development patterns.

What is an individual? The term is used to point up the distinctive characteristics of personality, including psychic and somatic response to one's environment. First we note that there are variations depending upon the degree, combinations and permutations in the basic matrix of the particular person. We classify those who are more alike as representing normal or average, those who are different or less alike, as representing the abnormal or peculiar.

Individuality represents the total makeup of the organism, which is predetermined genetically but altered by environment. The human develops in three spheres—physical, mental and emotional. Personality is the product of these ingredients which are brewed in the crucible of experience. It is molded from the genetic raw material by the stimuli of environment into the shape of personality, which in turn fits into the pattern of individuality. Through this kaleidoscopic design there remains a oneness. Each individual has his own particular fabric and binding material which makes him a little different than any other individual; this is identity. If the individual is altered in any way, he loses his identity or ceases to be an integrated whole. Identification applies to all matter from the simplest atom to the most highly developed organism. To use a simple example of this, let us take a grain of salt, which is sodium and chlorine, an integrated whole. The removal of either will leave sodium or chlorine, but not salt. An individual human cell is an integrated whole. A group of cells constitute a unit. Each individual person is one who is an integrated whole. Cells, tissues, organs, species, etc., all possess a distinctive property by which differentials, as well as likenesses, are maintained.

Different cells do grow at different rates, both pre and postnatally. The simplest cells demonstrate several areas of activity. Even a single cell organism is already highly evolved, varying in sensitivity, by responding in degree to a given stimulus.

The fertilized ovum, which is one cell, but contains forty-seven genes, 23 male and 24 female, plus all the dominant and recessive characteristics, with all the years of ancestry, gives this one cell embryo all the potentialities, based upon the unlimited chance mathematical combinations, of developing into a specific individual who will be unlike any other. These potentials are altered still further by the environment, even in the embryonic and fetal stages of development, some of which have been discussed under the dynamics of postnatal stages of development.

A familiar example of prenatal stimuli which causes an alteration in the organism, is the effect of German measles on the fetus. This has caused mongolism, blindness, and other congenital defects. There are several other defects of unknown etiology such as ectodermal dysplasia, hare lip, etc.

Another phenomenon which supports my contention, is twinning. The process of twinning may explain the cause of certain disturbances in developmental growth, and for our particular purpose, the effect upon facial growth.

Twinning

Newman, 1917, defines twinning as "essentially a phenomenon involving a physiological or physical isolation of equivalent or nearly equivalent parts of the blastoderm."

Twinning is twoing and so-called identical twins always result from a monozygotic egg. Identical triplets consist, not of a threeing, but of twoing, with one of the halves re-dividing. In these divisions more or less equal halves are produced. Rarely, if ever, are absolute equals obtained. It is obvious

that the more divisions, the less likely will the end products be the same. There are several ways in which fraternal, multiple embryos may be produced.

Identical twinning implies equal division and in general, equivalent cells are produced by division, but they are probably never complete equals. Slight differences are necessary to produce an individual who is better able to cope with his natural environment, which satisfies the law of survival of the fittest. This fact must be realized in order to discard the false concept of exact bilateral symmetry. Actually, what happens is that polarity causes a genetic tendency toward symmetry which automatically produces a right and a left side. But what is more important still, a cephalic and caudal end.

Newman also states that "identical twins which in fact are really partially identical twins, result when retardation lets two nearly identical points equidistant, or nearly equidistant from the original axis, form and become the growing points of the twin embryos." Niether twin is primary or secondary, each has formed from the original dividing egg into two whole individuals and the difference is strictly one of degree. Not only do we have morphological differences but we also have an energy difference. This is evidenced in people who maintain detectible temperature differences on the two sides of the body, or those who grow nails, or erupt teeth at a unilateral rate. Gesell, 1927, has suggested that two physiological ages may exist in one person at a given time. Had the cell not separated into a twin but remained single, the right and left half of this resulting individual could be representative of identical twins.

Newman's work also indicates that the duration of impact was important. He also presented another example to emphasize the possibility of longitudinal halving. When twin earthworms were to be produced, there was a longitudinal constriction cutting down through the worm embryo. Each side thus develops, not into a right or a left half, but into two new individuals. Frequently, in this process one worm, the autosite is joined with a smaller parasite, rather than two equal sized worms.

The autosite joined to a parasite is a good example of hemihypertrophy and hemiatrophy. A variant of the same process may occur in the human. When this situation exists, Gesell expresses this phenomenon "as though the particular individual remained as two conjoined hemicreatures, each with a discrete, yet half realized genetic destiny." This can be described more vividly by saying that one side may be "too little or too late" combined in development with a "too much or too fast" opposite side. These differences need not be extreme; in fact, in most cases they aren't. However, slightly graded differences, ranging from "normal" to either mild or severe, do occur. When the gradations are severe, they represent abnormality or pathology.

Finally, Lundstrom, 1948, states, "Quite unexpectedly the dispersion of differences in tooth-breadth between the right and left sides seem to be almost the same as the dispersion of differences between identical twins or their right or left side. This fact indicates that the factors governing the tooth-breadth variation in identical pairs are of a similar kind as those causing differences between the halves of the body —i. e. the factors which at an early stage become effective, probably in the embryonic stage only, while on the other hand, the later differences in environment must be of minor importance."

SUMMARY

The term assult should be used to indicate the positive force of environment. Assaults to man, which may lead to pathology, are embryonic, congenital and postnatal; they are of long or short duration, mild or intense, and real or imaginary. The damaging effects of assaults may be intensified if they occur in combination.

The emotional make-up of the individual has some influence over the appearance of biological cycles and symptoms. Changes in symptoms may be transitory or present. When present, symptoms may be observed or unobserved, but in either event interpretations may vary.

Repeated low level assaults may produce greater damage to the body than infrequent intensive assaults. Many common occurrences such as the loss of a parent, financial reverses, a change in neighborhoods, or a new job (especially when associated with marked cultural and social adjustments), lead to changes in the impact of illness within an individual. Protective devices of the body may also work separately or in simultaneous united action.

The process of evolution determines the rate of change as well as of its direction. Man must give serious consideration to synchronizing his environment to a rate not faster than his developmental ability to cope with change.

There are two approaches to the study of malocclusion. One of these is based upon anatomy, and the other upon physiology. Certain etiological concepts have been accepted in entirety, while others have been accepted as being contributory in nature. Factors such as muscle habits, endocrine, allergy and emotion have been grouped under the term dynamic. To these I have added the biological concept of malocclusion, which is based upon evolution and upon phylogenetic order, and has come about as the result of considerations involving the processes of individualism and twinning.

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