

THE INTER-RELATION OF CAUSES, FACTORS AND TREATMENT IN ORTHODONTIA.

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Nothing is more fatal to a correct estimate of any subject than lack of proper perspective. In considering the orthodontic problem it is therefore essential to take a wide excursion in the realm of our acquired information in order to arrive at some idea of its nature in a cosmic sense. Any narrow minded view in this matter is fatal to a true conception of the field of usefulness of orthodontic treatment with its attendant possibilities and limitations.

In order to be successful in any line of work it is necessary to determine as far as possible the basic principles or the fundamental philosophy of its nature.

With this objective in view we must accept the fact that from a scientific standpoint we have only some very incomplete information regarding living tissues and that, to arrive at any conclusions at all, we must supplement this with some philosophic speculation. In the last analysis we may even have to include some religious speculation.

However debatable our conclusions may be we should at least formulate an hypothesis upon which to base our efforts in treatment which we trust will contain some elements of logical harmony with conditions as we find them. The results of treatment are the final arbiter as to the soundness or fallacy of these conclusions.

In order to hold ourselves as concretely as possible to the problem on hand we must consider that biologically each human individual is a result of his heredity, plus his living activities and environment. Spencer has stated this to the effect that life is a continuous adaptation of internal conditions to external conditions.

Whether we accept the theory of evolution or the biblical story of the Garden of Eden, it is quite reasonable to suppose that it is part of the Divine plan that man should possess an organism which would be in harmony with his surroundings to enable him to make his span of life on earth a satisfactory one.

From a physical standpoint it seems quite clear that mans organism is capable of effecting a satisfactory balance if subjected to certain conditions. This is demonstrated by the American Indian, The Eskimo and practically all our anthropological prehistoric data. These conditions demand a vigorous form of existence, in order to eliminate the unfit, combined with a homogeneity of propagation and living conditions over a long period of time.

Man was subjected to just these conditions for long ages of time before recorded history and our orthodontic problem has arisen from certain changes which have taken place in this conditions comparatively recently in comparison to the length of those periods of time.

Man was destined however to inherit the earth and since he has done so it is a questionable matter of how good a job he is making of it, particularly in regard to his treatment of himself, in view of the latitude that has been given him in the matter of his personal liberty.

Along with the biologic problem, this volitional element in the life of man is the other great underlying factor to be considered in the ultimate destiny of the race including incidentally his dental equipment.

The factors that are basically responsible for the orthodontic problem are therefore the changes in environment and nutrition which man has undergone, the result of crossbreeding of dif-

ferent types and races and, pervading it all, that intellectual, volitional, spiritual element which dictates his actions in either the right or wrong direction with their subsequent effects upon his physical make up.

The real solution to the orthodontic problem in man lies in the development of his intellectual and moral qualities. All the religious speculation and philosophic reasoning of the world is involved in the problem.

The combinations which these factors are liable to produce are staggering to contemplate if out of this material we attempt to define what constitutes an individual normal.

Looking at the problems from this standpoint it would appear almost hopeless to coordinate our efforts when our goal is indefinable. It is certainly conducive to a certain humility of spirit in our considerations. Any preconceived idea as to the final arrangement of the teeth for a given individual, without taking into consideration all these factors, would appear untenable.

Any organism in changing over from one set of conditions to another can very logically find itself, temporarily at least, out of harmony with its surroundings causing a condition of unadaptability in some of its organs. Of all man's organs the teeth are the only ones which are unsusceptible to changes in volume after they have been determined at a very early period in his embryology and it is therefore quite logical that these are the ones most frequently out of harmony with their ideal arrangement.

From the anatomy of the teeth as well as their location in the skull we have a fairly good conception of what the arrangement should be under ideal conditions. Our problem is what to do when this arrangement does not obtain and is concerned basically with the biologic and psychologic factors involved.

When, due to natural limitations the ideal arrangement to be desired seems unfeasible of attainment, judging from past experience in treatment, it is perfectly justifiable to seek a satisfactory compromise.

If we are to be of any use as orthodontists, we must know the facts, accept them as we find them and confine our efforts within the limits which experience has taught us as possible with all our faculties open at all time to improvement in methods of coping with conditions.

Orthodontists should congratulate themselves in being engaged in a work which contains so much of the elements of the creative and artistic. The ultimate value of an orthodontist to society does not depend so much on the extent of his knowledge of the branches which are collateral to the problem such as biology, physiology, psychology, etc., as upon his ability to apply in a practical way, to the problem on hand, what knowledge he does possess.

In considering the orthodontic problem proper in a practical manner three questions present themselves in logical order:

- 1st Why do we have malocclusion?
- 2nd What is our objective in orthodontic treatment?
- 3rd How may we accomplish desirable results?

The position of the teeth from the orthodontic standpoint must be considered as merely the end result of the action of an involved series of forces. The result of the actions and re-actions of these forces finally terminate in a state of balance, peculiar to each individual, which, may be considered satisfactory or unsatisfactory, as the case may be.

It therefore seems logical to approach the problem from the standpoint of the active causes which are these forces and coordinate our available information in a classification which will rest on that basis. Malocclusion of the teeth may therefore, from this viewpoint and for convenience sake, somewhat arbitrarily be grouped under the following four headings:

1st Disharmony in the biologic proportions between the amount of tooth substance and jaw development.

2nd Incorrect functional activities of the individual with particular reference to the muscular activity controlling the relation of the jaws to each other.

3rd Mutilations, such as prematurel extracted teeth and loss of other tissues.

4th. Abnormalities, such as supernumerary and congenitally missing teeth, cystic formations and other abnormities and malposition of the teeth which cannot be classified under headings 1, 2, and 3.

Disharmony in the biologic proportions of the teeth and jaw substance is basically a biologic problem.

On account of the lack of definite necessary information, orthodontia offers a very speculative element in many of its most important phases. The amount of tooth substance inherited by the individual is determinable but the amount of bony development to accommodate this tooth substance is not determinable and from the biologic aspect resolves itself into a question of judgment on the part of the operator as to how much normal bony development may be expected for any individual case and, if not sufficient, how much more may be produced by mechanical stimulation. One thing is certain, that, unless sufficient is obtained not only to accommodate the teeth but to produce that state of *balance* which will not be affected by the other forces involved, no permanently satisfactory result may be expected.

The problem does not end here either, as no result can be considered satisfactory unless the proportion of tooth substance and bony development is in harmony with the balance of facial development. In the light of practical observation, there are many cases where the tooth substance is entirely out of harmony with facial development even after this has reached its maximum. It is obvious how difficult it is to lay down any hard and fast rules to govern treatment expecially during the formative period when there is no method of determining at what *age* and to what degree development will occur. Certain it is that every element which will promote normal bodily growth should be utilized expecially at the hands of a competent pediatrician and that orthodontic interference should be looked

upon as merely an aid to such treatment. There is a *biologic limit* to bony development of the jaws in proportion to other bodily factors, and one of the great factors in orthodontic failure is due to lack of judgment in this particular.

The biologic and artistic features can only be handled successfully by the utmost delicacy of judgment, the acquisition of which, like all other forms of art, can only be obtained by long experience, keen observation and artistic feeling.

When malocclusion is due to incorrect habits or functional activities of the individual, which, from the orthodontic standpoint are mainly associated with the voluntary muscular activity of the parts involved, the problem is basically psychologic in nature.

Mechanical interference to so arrange the teeth to make it possible for the jaws to function normally is of indispensable importance but the degree of success obtainable will depend mainly on careful and intelligent instructions on the part of the orthodontist accompanied by all the cooperation possible on the part of the patient. Appliances should be so devised that they will be a constant reminder, by the physical presence, as to what the correct function should be. The *degree* of cooperation which can be obtained is another of the indeterminable factors on orthodontic treatment but upon this factor will depend the degree of success obtainable. There is great truth from the orthodontic standpoint in Lamarck's statement that "Form is the result of functional activity". Undoubtedly form and function go hand in hand, the one directly affecting the other.

Mutilations and abnormalities from the causes already mentioned but add to the complications in orthodontic treatment, their solution depending primarily upon the biologic, psychologic and aesthetic factors involved with final recourse, if necessary, to surgical interference and prosthetic restorations.

Based on the foregoing considerations, therefore, "*The Object of Orthodontic Treatment*" might be stated as: The best arrangement possible, within biologic, functional and aesthetic

limitations to produce the most efficient and artistic organ of mastication.

A Re-arrangement of tissues from a *balanced* undesirable condition to a more satisfactory arrangement which will again be *balanced*.

The means of accomplishing desirable orthodontic results may be summarized as: mechanical appliances to produce changes in biologic proportions of the jaws and arrangements of the teeth; appliances to aid in producing changes in functional habits; surgical interference and prosthetic restorations and all the means available to promote the highest standard of physical and mental well-being. The high art of orthodontic treatment depends upon great vision and foresight in weighing all the factors to be considered in order to achieve a result which will be satisfactory and *possible* of attainment. The permanent result of any orthodontic effort will depend upon the *balance* of all the forces involved.

When actual mechanical treatment is instituted several very important factors must be considered which experience in treatment has disclosed. All mechanical force, being extraneous in its nature, produces biological changes in the tissues affected. It is a matter of common knowledge to experienced orthodontists that movement is more easily obtained during the early period of treatment than later. There is a time limit to which the length of mechanical treatment is desirable. At the present time this matter is open to a wide difference of opinion among orthodontists.

One of the most difficult problems with which he is constantly confronted is the age at which mechanical interference is most desirable. A biologic disharmony which is apparent at an early age, may be entirely overcome by natural processes at a later age and the application of mechanical stimulation at the wrong time may be not only entirely unnecessary but actually harmful. Further, the end which he would *like* to achieve may be found to be impractical when the full development of the individual has taken place producing a totally unsatisfactory result which

will necessitate a considerable amount of further treatment to effect a compromise which will be satisfactory. Taking all the factors into consideration it would seem that in cases of biologic disharmony, the inflexible rule of striving in all cases for a denture with a full complement of teeth is both untenable in conception and impractical in application. This conclusion is based on personal experience as well as on observation of the results of others. The decisions to be made in this class of cases, are among the most difficult to be made in the practice of orthodontia. It must be taken into consideration that in producing room in each jaw for the accommodation of teeth, force can only be applied in bucco-lingual and mesio-distal directions. Force in the mesio-distal directions produces effects in the region of the third molars which in many cases are undoubtedly impacted thereby, producing the necessity of their extraction. In many cases it is simply a question of choosing between the loss of these teeth as compared to others more mesially located. In cases of this kind the size of the teeth, the general bodily development, the size of the oral cavity, the bony development of the alveoli, and the muscular tone of the parts involved are the factors to be considered. It is the policy of the writer not to commence treatment any earlier than absolutely necessary.

In cases of incorrect relation of the jaws due to function, the problem is not quite as difficult. All function is intimately related to form and when this is incorrect, the tendency toward further deformity is a logical sequence. It would seem logical therefore that the sooner treatment is instituted, the sooner will the tissues be directed toward normality. This is undoubtedly the case in most instances but in these cases the degree of cooperation that can be enlisted on the part of the patient is in most cases the most important factor. This factor is generally dependant upon the age and mental attitude of the patient. A considerable amount of time and effort which might be wasted at an early age, might be exceedingly productive of results at a later age without subjecting the tissues to the harmful effects

of too long an interference of a mechanical nature. This refers particularly to cases of disto-occlusion. Cases of mesio-occlusion or linguo-version, of the upper incisor teeth and cases of cross-bite, the earlier treatment is instituted, the better, as these cases very often require very little cooperation on the part of the patient and the deformities if allowed to continue are rapidly progressive.

The complications which combinations of these four groupings can produce are limitless and can only be discussed in terms of generalities, the results to be obtained being dependent in last analysis on the inherent artistry of the operator. Due to the vast difference of opinion among orthodontists any expressions here given can only be taken for what they are worth as personal opinions.

The premature loss of any tissue is to be deplored and any means to avoid malposition of teeth due to drifting from lack of support, should be aided by mechanical means at the earliest moment.

Long experience in general practice has created the opinion that all prosthetic restorations should be used as a last resort. In all cases of missing teeth, all means within artistic limitations, should be used to close up spaces even going so far as to resort to extractions to harmonize issue substance between jaws. The employment of full X-ray examinations is absolutely necessary in diagnosis to discover in advance all congenitally missing teeth, cystic formations etc.

When mechanical interference is deemed advisable there is a great wealth of material in the way of designs in appliances which are at the disposal of the discriminating orthodontist and should be selected in their relation to the physiologic nature of the work to be performed. In this respect again there are violently contrasting differences of opinion, among orthodontists as to the manner in which the work should be performed. There is a wide difference in this conception between the users of those very positive types of appliances as the pin and tube and ribbon arches and the users of appliances employing gentle pressure from auxiliary springs.

The mechanical forces utilized during treatment should be in accordance with biologic and physiologic laws. Nothing is truer in this connection than Milo Hellman's statement that "Teeth move in response to mechanical stimulus but not according to physical laws". They move more according to physiologic laws.

Among the qualities to be desired in appliances might be mentioned the following: ease of manipulation, ability to produce gentle continuous pressure to induce physiologic movement of crowns and roots of teeth with a minimum of trauma during movement but at the same time with sufficiently definite action not to undesirably hinder progress, self limitation of action and ability to produce different types of action to be carried on at the same time without the one interfering with the action of the other. This latter refers to cases where it is desirable to produce changes in jaw relations simultaneously with the action to induce bony development and individual movement.

The cases presented, with their treatment, have been carefully selected to represent the different types confronted with in practice and representing certain generalities in the application of mechanical interference applicable to innumerable variations.

It might be mentioned here that the Angle's classification, from the viewpoint of the arrangement of the teeth to each other fits into the scheme as follows:

Angle's Class I or neutro-occlusion corresponds with cases of disharmony in biologic proportions with incidental malposition of teeth.

Angle's Class II and III with sub-divisions fit in with cases of incorrect functional activities.

The tremendously important matter of the orientation of the entire denture to the skull is appreciated by the writer but there still seems to be a great deal of work necessary to bring this down to a thoroughly working basis for practical purposes in orthodontia. The arrangement of the teeth with reference to the imaginary line of Spee however is constantly in mind and will be further referred to in the description of actual treatment of cases.

In personal practice no limitations are set on any type of appliance as they probably all have their uses but at present a combination of the labial arch with auxiliary springs in combination with the lingual arch with auxiliary springs seems to fulfill all the requirements encountered in treatment. The technical details of the construction of these appliances as used in practice with a description of their application, follows.
