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THE RELATIONSHIP OF HUMAN CONSTITUTION TO DISEASE[1]

THREE years ago at the meeting of this association in Boston I had the honor of reporting before the anthropological section the results of the attempts of our Constitution Clinic at the Presbyterian Hospital to apply the technique of anthropometry to clinical medicine. It is particularly gratifying now at the end of three years to discuss before the section on medicine the results of the work. Now because our first approach to the study of the subject was along the lines of anthropometry it must not be supposed that we have looked upon morphology as the main issue. This particular path was chosen simply because it offered at the moment the most obvious and practical entering wedge. It was indeed quite clear from the first that the subject of human constitution was sufficiently extensive and involved to occupy fully the efforts of many generations of workers; and as we have proceeded we have seen how true was Pope's famous line that the greatest study of mankind is man.

Viewed from this aspect disease ceases to be an entity in itself, a thing as it were added to or carried by man, and becomes rather the inevitable expression of conflict between unique individuality and an adverse specific environmental force. It is of course no new thought that the factor of susceptibility or predisposition to disease is of equal importance with the external specific agent. But perhaps it is just because of its antiquity that this factor has been overshadowed temporarily by the intensive studies which modern workers in medicine are directing at the lesion and the external agent.

The logical outcome of such a conception of disease is to turn an equally intensive research upon the factor of susceptibility. Obviously this must be a quality of the individual, an integral part of his constitutional plan. The successful investigation of this attribute consequently, as of any single character of plant or animal life is doubtless best furthered by a general and complete study of the whole organism. And so the thoughtful physician finds himself not primarily a student of disease, or menacing environment, but

[1] From the Department of Practice of Medicine, Columbia University and Presbyterian Hospital, New York City. Read before the American Association for the Advancement of Science, Section M, Medical Sciences, Washington, D. C., December 29, 1924.

rather of the natural history of man. The assumption of this attitude toward his patients was a common thing for the doctor of past generations in medicine. Indeed Martius has well said of Hippocrates that he was a doctor who thought like a naturalist. It is further interesting to observe that with the increasing definiteness of the science of genetics, the clinical investigators of to-day are turning back for light to the fundamental work of those great naturalists, Mendel, Weismann, Darwin and Galton.

Ordinarily when we think of constitution, it is as much a part of the individuality as any other attribute and can not be thought of except as a continuously personal property of the individual which is present from the moment of birth until death. But it is quite clear that the constitution must change with the different growth and development phenomena which take place in the life of the human organism. Now it is just at this point that the whole subject of constitution and the glands of internal secretion appear to be related. I do not believe that we are in a position to say at this time that the balance of the glands of internal secretion actually determines personality and constitution, but it is undoubtedly true that just as constitution varies in relation to the stage of the growth and development of the organism, so the glands of internal secretion are very largely concerned with this function in the life history of the individual. Any comprehensive study of the question of human constitution, therefore, must be more or less divided into five main epochs; the first, that which precedes puberty; the second, those years which include the puberty process; the third, that longer stretch of the active, vigorous, adult life; the fourth, the episode of climacteric; the fifth, the period subsequent to this. The organism obviously possesses a different arrangement of potentialities in each of these periods with which to meet the pressure of environment. Our studies so far have been limited to the adult or interpuberty climacteric phase. From this point of view all the studies that have been made on growth and development form definite contributions to the study of human constitution, and throughout the history of medicine there have appeared many attempts to evaluate this elusive quality of the individual. Formerly there was no very definite meaning for the word constitution; it implied rather a certain robustness or weakness of the individual. Obviously, there are a vast array of characters which together express the constitution of a man so that we have defined the term as follows:

Constitution is that aggregate of hereditarial characters, influenced more or less by environment, which determines the individual's reaction, successful or unsuccessful, to the stress of environment. In order to simplify the task of studying these many and varied elements, man's total personality has been divided into four main categories or panels. The use of the term "panel" in this connection arose from the conception of a Japanese screen composed of four panels across which was painted a complete picture. Any one of the panels alone would signify little, for upon it would be found but one phase of the whole. Now the four main panels of personality which present themselves for investigation are the hereditary unit characters found in the domains of anatomy (morphology), physiology, psychology and immunity. Each of these may be considered to occupy one panel of the great screen across which man's personality is drawn. Now it has been found that if the four panels of personality be studied and correlated in each person of a large number of individuals, one soon realizes that there is frequent repetition of certain combinations of characters. These recurrences are so definite that from a careful analysis of a given morphologic panel it is possible to predicate with great correctness the nature of the other panels. By such a plan of the most direct and objective study of human beings it is often amazing how much can be learned of their varied individual qualities. Indeed, one comes to realize now how valuable and keen were the findings of certain of those supposedly fanciful observers—the physiognomists and phrenologists. Petrus Camper, Blumenbach, Guvier and Levater made contributions to the study of man which are of great value to physicians.

There has of course always been much discussion of the value of morphology as a criterion for classification of the human race. Anthropologists have depended very largely on body size and proportion as means to classify mankind into races. Medical men, too, have, since Hippocrates, striven to separate out types. If one reviews the literature, however, one is impressed by the fact that under a variety of different names two main types only of the human race have been described—the long narrow and the short broad. In our studies we have assumed that capacity to react with a specific external agent, that is the possession of specific susceptibility, was a basic unit character. Consequently, the appearance of a disease could properly be looked upon as evidence of the presence of that specific susceptibility. In other words, the presence of disease has been used as a means of classifying human beings. The racial factor which is common to all men does not appear to be of great consequence for this plan of inter-disease group comparison. We are not primarily concerned with an individual's position in a geographic classification of subspecies, but rather in that individual's position in respect of a grouping based on disease

potentiality. Furthermore, the factor of geographical race in this situation is confusing. This point is well illustrated by the instance of three cases of perforated gastric ulcer lying side by side in the Presbyterian Hospital at the same time. The likeness of the three, one to another, was striking, and anthropometrically their measurements and proportions were almost superimposable. Nevertheless, these three men sprang from three distinct racial roots—one an Anglo-Saxon, one a Pole from Middle Europe and one an Italian from the shores of the Mediterranean Sea. Obviously, these three individuals so similar in their morphology and in other attributes of personality, including a specific disease susceptibility, were not pure examples of their respective racial stock. They were mixtures originating from widely different sources. Then through the generations their antecedent germ plasm received infusions of other strains in certain proportion until these three phenotypes appeared, practically identical not only in respect of their bodily or mental habits, but also in their special disease potentialities. It may well be that the conception of race as we have so far held it is no longer tenable. Undoubtedly the increasing facilities for migratory movements during the last two or three hundred years have forever shattered the biologic isolation of the subspecies of man. Now, whether or not disease susceptibility as a criterion for grouping mankind will satisfy statesmen and political economists is a matter for discussion. Certain it is, however, that the preliminary studies of the psychologic panels of the different disease groups so far made suggest as wide a divergence in this phase as in the morphologic. Possibly a temporary reclassification of human beings on a disease potentiality basis will help to clear the blurring of differential characters which has resulted from extreme racial admixture. Furthermore, it would seem that the manner in which an individual relates himself to the social structure depends largely on his psychic pattern. Consequently, any method of study which clearly displays mental qualities may help in selecting the life work for which a given person is best fitted. Thus a system of classification based on disease potentiality serves a double purpose. On the one hand, it may well assist us to discover a man's specialized capacities for work, and, on the other, to preserve him for its accomplishment. For the physician, in any case, it is a form of classification of great importance.

Now to whatever classification of mankind studies of human constitution may ultimately lead, any objective method of investigation of whichever panel, be it morphologic, physiologic, psychic or immunity, will be forced to meet one direct and critical query. Which of the observed phenomena in the given phenotype are genotypic, and which are paratypic? Furthermore, in the case of genotypic characters which are truly idiotypic and which idiokinetic? Much has been written recently concerning these complex qualities of constitution, among which disease predisposition is one of the greatest in importance. Most writers on the subject recognize two phases, namely, inherited and inheritable (idiotypic) constitution, and influenced, non-inheritable (paratypic) constitution. Tandler and Julius Bauer speak of the latter as "condition." Very sharp question as to the dependability of morphology as an index of the presence of other inward or unseen qualities in the organism has been brought by students of genetics. As pointed out by Siemans and others, experiments with both plants and animals have repeatedly shown that in dominant inheritance a heterozygous individual may not be externally distinguishable from the homozygous; and that it is not possible to judge of other inherited factors from the externals of a heterozygous form. But it must not be forgotten that the predisposition to a given disease may well be a dominant character which can not appear until the appropriate disease arising from the clash with the specific external agent demonstrates its latent presence. Thus such a dominant susceptibility may lie unrecognized in a fortunate person who escapes the clash, just as an unexpressed recessive character does in the skipped phenotype.

Notwithstanding these important questions, however, we are becoming more and more convinced that the purely objective studies of the four panels and their correlation in members of definite disease groups yields evidence which justifies the assigning of greater importance to morphologic criteria than has heretofore been acceptable. If the phenotypes which we have studied are all paratypic variants, and none of them pure idiotypes at all, then whatever parakinetic forces have modified them must have acted equally on skeleton and predisposition. For certain it is that in the case of two such diseases as cholelithiasis and gastric ulcer anthropometric differences have been as wide and constant as any that have ever served in the past to differentiate the races of men. The fact that original pure racial idiotypes are rapidly disappearing, if indeed they are not altogether gone, does not preclude the possibility that within the resultant hybridized mass may be appearing new groups of phenotypes with similar disease potentialities, as illustrated, for example, by the three cases of perforated gastric ulcer already referred to.

One only has to mention a few of the outstanding differences found in the sizes and proportions of different parts of the skeletons of these two strikingly different disease races to realize the value to the

clinician of this sort of constitution study. The following measurements (averages) show a few of the characters which differ widely:

	Gastric ulcer	Gall bladder disease
Ponderal Index	34	44
Gonial Angle	112°	122°
Subcostal Angle	55°	73°
Ant. Index up. jaw	54	58
A. P. Thor. Diam.	212 mm.	256 mm.
A. P. D. Ch.h.	64	74

Similarly striking differences have been observed between other disease groups, as, for example, pernicious anemia, asthma, nephritis and pulmonary tuberculosis. The differences are not all found in the same parts of the body, but may be equally great. Furthermore, certain interesting but as yet not altogether comprehensible differences and lack of differences between the sexes in each disease group have appeared. So far as we have been able to analyze the material it appears that there are three ways in which the sex factor enters into the relationship between constitution and disease. In the first place, there is the situation wherein both sexes display diminished secondary sex characters and likewise present the eunuchoidal trunk extremity ratio.

Thus for example both sexes in the pernicious anemia race have shown short trunks and long extremities, the so-called eunuchoidal habitus. Their secondary sex characters furthermore have enhanced this picture of gonadal inferiority. But as Tandler and Gross have pointed out, this incomplete sex differentiation may actually disclose the basic species form common to both sexes. From this point the thought arises that without the protection of a fully differentiated sex influence certain idiotypes which carry a predisposition to easy blood destruction and poor hematopoesis develop pernicious anemia.

The second manner in which the sex factor finds expression is in those diseases which are found much more frequently in one sex than another. Thus, for example, gall bladder disease is three or four times more common in women than in men. But in addition to this well-recognized fact our studies have shown that the males who develop cholelithiasis clearly tend toward the fat avirile type, or may express the feministic trend in their psychic pattern. Furthermore, the male pelvis among gall bladder people is the widest of all males and females except that of the pernicious anemia females. This pelvic largeness is reflected again in the high bi-iliac-bi-acromial index of the males of the gall bladder race. From these observations it would seem not unreasonable to suppose that the more completely differentiated individuals are toward maleness or femaleness, the less close should be their predispositions for those diseases in which the sex factor is a determining one. Possibly when studies of all the panels are completed and correlated it will be found that those individuals of one sex who succumb to a disease chiefly encountered in the opposite sex should exhibit signs of an incomplete differentiation toward their own sex.

The third way in which the sex factor may manifest itself is not as well defined as are the two preceding. Briefly, it appears that when the sex character differences are accounted for there remain marked differences between the sexes in those morphologic characters which are criteria of species. These latter differences are most marked in the group of nephritics. Thus among other things the females of the nephritis people have relatively longer abdomens, lower pelvis, lower sternum, lower set umbilicus and relatively greater length of long bones than the male. It is as though the external agents clashed with the predispositions of males of one species and females of another to produce nephritis. If one could express it in terms of experimental animals it would be like saying that the nephritis group was composed of male fox terriers and female greyhounds.

These aspects of the influence of the sex factor in constitution have been perhaps the most interesting and unexpected outgrowths of the anthropometric studies. They are of course far from being firmly established and it is to be hoped that much more work may be done on this phase of the subject. There is no doubt either that the measurements and ratios have been in accord with other clinical observations upon the relationship of sex and disease.

In conclusion then it may be said that it has been found possible by direct observation to correlate morphology and predisposition to disease in the case of at least five well-recognized clinical entities. Obviously, there is no sharp line of difference between the disease races. Overlappings must always occur, for there is no absolutism in any hybridized living form. But notwithstanding these overlappings, there can be found in the morphologic panel alone a great deal of important information which throws light upon the other qualities of the phenotype. When we have achieved a dependable method of measuring the qualities of the other three panels and can correlate them properly, we shall begin really to understand something of that very particular constitution of a human being which is so great a force in determining success or failure in the battle of life.

GEORGE DRAPER

COLUMBIA UNIVERSITY
AND PRESBYTERIAN HOSPITAL