SOME MANIFESTATIONS OF A HEALTHY HEART IN THE YOUNG FREQUENTLY TAKEN AS INDICATIONS FOR TREATMENT.*

By JAMES MACKENZIE, M.D., LL.D., ETC.,

LONDON.

WHEN I was asked to take part in the discussion on the treatment of heart disease in the young, I cast my mind back on my experiences to see if I could usefully join in the discussion. On reflection, I was struck with the fact that I had seen a large number of young people who had been subjected to many forms of treatment because of the presence of certain phenomena which my experience had taught me were signs neither of disease nor of impairment. When I reflected further on why it was that members of our profession frequently misapprehended the significance of cardiac phenomena, I could only attribute it to the state of confusion in which cardiac symptomatology has been involved, and the manner in which it is taught in the schools. It seemed to me, therefore, that it might be profitable to place before you the results of some observations which I have made in the endeavour to appreciate the significance of certain cardiac phenomena, inasmuch as the first step towards treatment is a knowledge of what you are going to treat.

The Essential Purpose of a Medical Examination.

The main object of a physician's examination is to determine the value of certain symptoms of which the patient may complain, or the value of certain signs which the physician may detect. After the examination the essential questions which the physician has to answer before he considers the question of treatment are: What bearing has such a sign or symptom on the efficiency of the circulation? Does their presence indicate heart failure, or do they foreshadow its occurrence at some future period?

In order to show how difficult it may be to answer these questions I would refer to a deficiency in our knowledge which confuses and misleads those who seek an answer.

How this Purpose Fails.

(a) *In the Case of Irregular Action of the Heart.*—Let me illustrate this in a very simple fashion. Let us suppose a doctor detects in his patient or himself an irregular action of the heart, and he wishes to understand its significance. In other words, he wishes to answer the questions which I have just enumerated. Does the irregularity indicate heart failure at the present time, or does it foreshadow its possible onset at some future period? He turns to his textbook for enlightenment, but fails to find the answer to his questions. He may ransack a medical library and even then he will fail to get an answer, or the slightest suggestion as to how to approach the subject. Some large books ignore the subject, others deal with it in so perfunctory a fashion that no clear perception is forthcoming, while in the remainder the subject is dealt with in such a way that it merely bewilders the reader. Thus he will find such statements as that irregular action of the heart is of little or no importance; then a few pages further on the same writer will state that he rejects candidates for insurance if they show an intermission of the pulse at rare intervals. In the description of grave conditions, a passing allusion to irregular action of the heart may convey the idea that it is one of the signs of a serious condition, but there is not the slightest hint given to help the reader to differentiate the innocent from the serious.

(b) *In the Case of Murmurs.*—If it is desired to estimate the significance of a murmur, the same absence of reliable information is found here. This subject, which has received such long and exhaustive study, is invariably dealt with in such a manner that it would be impossible for the reader to glean information which might enable him to answer the questions which I have put, except perhaps in the case of some murmurs associated with advanced disease. Consider, for instance, the origin of the present day conception of the significance of heart murmurs. Within a few years of the discovery

of the stethoscope the murmur was looked on as a sign of disease. This was at a time when the cause of the murmurs was not understood and before any one had watched individual cases long enough to find out what the influence was on the life of the person affected. Doubtless much has been done since then to throw light upon this subject; nevertheless, the early teaching has so affected the profession that the great majority of medical men to-day are labouring under the erroneous doctrines taught in the early days of auscultation, and so look upon murmurs as evidences of disease or impairment of the heart. Upon this imperfect conception of the meaning of murmurs another idea has been based—namely, the back pressure theory of heart failure. While this theory contains some element of truth, it is so applied as to give a totally false conception of heart failure in the great majority of cases. Thus we find cases with a mitral murmur, systolic in time, diagnosed as mitral disease, and, if there are no signs of heart failure, the individual is said to have "mitral disease, with good compensation." The very term "compensation" conveys the idea of impairment, and that a special effort of the heart has enabled it to combat this weakness. It is in consequence of this misleading conception of heart failure that we find the great majority of heart affections labelled by the murmurs which the heart happens to make, although the cause of the murmurs has nothing to do with the failure of the heart.

(c) *In the Matter of Prognosis.*—This great deficiency in our knowledge of cardiac matters comes out with irresistible force when an attempt is made to deal with prognosis. Practically every writer who gives the matter his serious attention is forced to admit that we do not possess the data on which to build a reasonable and sound prognosis. One of our greatest and most experienced clinicians, the late Sir William Gairdner, has accurately described the position of the medical examiner for life insurance in his method of estimating a life value. He says: "There is an incalculable element in most of the cases . . . which we deal with in the most curiously unsatisfactory way, either by rejecting the life altogether, or by putting on a big loading, which, it must be admitted, we assess upon no very sound or clear principles, or, on the other hand, by winking at the defect and passing it over." He points out that there are no reliable data on which to estimate the prognostic significance of murmurs and irregularities. This description of the absence of reliable data on which to base a prognosis holds good to-day, not only in life insurance, but wherever a prognosis is based on a physical examination.

I dwell with insistence on this great defect in our knowledge of the significance and meaning of cardiac phenomena, in order that you may better appreciate certain investigations which have been pursued with the purpose of clearing up these matters. I am far from saying that this deficiency has been made good, for that will require the continued labour of many observers; but there are certain lines which must be followed, if this object is ever to be attained, and these I will briefly indicate, and cite some of the results which have been achieved.

Method Employed to Find Out the Meaning and Significance of Signs.

Let us first consider irregular action of the heart. Shortly after entering general practice over thirty years ago, I was struck with the frequent occurrence of irregular action of the heart among my patients, but at that time the subject was dealt with in textbooks in such a way that no trustworthy estimate could be made of its nature or significance. I began in a very simple way to seek for some basis of classification, and was able to separate some of the irregularities into groups according to the different ways in which the chambers of the heart participated in their production. Later this subject was taken up by many other observers, who studied it both clinically and experimentally, and as a result of these labours irregular action of the heart, which until a few years ago was one of the most obscure subjects in clinical medicine, is now one of the best understood, and our knowledge is based upon sound physiological data. This separation of irregularities into groups according to the mechanism of their production is sometimes looked upon as being merely an academic exercise of little practical importance. As a

* Read at a discussion on the treatment of heart disease in children at the Royal Society of Medicine on December 13th.

The Significance of Murmurs.

In order to find out the significance of murmurs I followed the same lines as those I had pursued in determining the significance of irregularities. Here I shall not enter into the results of this inquiry into murmurs due to damaged valves, but shall restrict myself to those murmurs which are recognized as functional, and to those where it is doubtful whether they are functional or organic. These are always systolic in time, and their position of maximal intensity may be at the apex, base, or mid-sternum. The result of this inquiry showed that these functional murmurs in themselves were consistent with perfect health, and that their cause never led to the slightest sign of heart failure. Where these murmurs were associated with heart failure there were invariably evidences that the heart failure was the outcome of the myocardial condition and not of the supposed incompetent valves. In any given case with heart failure there was usually present some condition which impaired the functional efficiency of the heart muscle, and induced an exhaustion of it such as occurs in an exhausting illness, or with structural changes, as fibrous or fatty degeneration of the muscle wall. Now these conditions happen so rarely in the young, and when they do happen the evidences of actual disease are so striking, that I am justified in stating that functional murmurs in the young, in the absence of evidence of muscle affection, are signs neither of disease nor of impairment.

Irregularities and Murmurs Consistent with Perfect Health.

I have put this view to the test by watching a large number of individuals, and by following the lives of those showing these signs for such long periods that I have no hesitation in saying that murmurs and irregularities may be manifestations of a perfectly healthy heart in the young. The recognition of this fact is of great importance, for if the knowledge that healthy hearts do frequently present murmurs and irregularities was fully grasped, then the doctor would study his patient from a different perspective, and would cease to be obsessed by these and other seeming abnormalities, but would direct his search towards finding out how far the cause of these and other phenomena modified the functional efficiency of the heart.

Importance of Muscle Impairment.

When the fundamental principles underlying the production of heart failure are thoroughly understood, it will be realized that the heart failure, whatever form it may take, is due to an impairment of the functional efficiency of the heart muscle. So far, then, as heart failure is concerned, the significance of any sign must depend on how far its cause embarrasses the heart muscle in its work. It follows therefore that a murmur or an irregularity is only of significance when it is associated with some manifest impairment of the heart muscle, and that an inquiry must be made which will bring out the true meaning of any sign by searching for evidences of muscle impairment.

Signs of Muscle Impairment.

What are the evidences by which we can recognize affections of the heart muscle? Except for certain irregularities, which in rare cases give very important information, the evidence is somewhat limited.

(a) *Increase in the Size of the Heart.*—The first of these is a change in the size of the heart, due either to dilatation or to hypertrophy of its walls. Before we can assume that any increase in size is abnormal, we must first remember that there is no standard size, shape, or position, and that the variations which healthy hearts, especially in the young, can show, are very considerable. Doubtless in certain diseases of the heart the increase in size is so marked and so characteristic that little difficulty is experienced in recognizing it as a morbid condition. With functional dilatation, however, the difficulty of recognizing its significance is so great that evidence based upon increase in size, unless this is extreme, should never by itself be considered as sufficient evidence. If it is associated with persistent increase in the rate of the heart and marked loss of power, then it forms a valuable indication. But an apex beat in the fourth or fifth interspace, one inch outside the nipple line, is not in itself an evidence of muscle affection. It is well also to bear in

mind that impairment of the heart muscle, dangerous to life, may be present without increase in the size of the heart.

(b) *Murmurs not Necessarily a Sign of Dilatation.*—A systolic functional murmur must not be considered as due to the dilatation, because these murmurs may not be the outcome of the dilatation. If a large number of healthy hearts be carefully examined it will be found that some show murmurs with the heart of a size usually assumed to be normal. These murmurs may come and go when there is no change in the size of the heart; they may be perceptible only when the individual is lying down or when he is standing up; sometimes they are only present when the heart is excited, at other times they are found when it is beating slowly and quietly. It frequently happens that though there may be marked dilatation, with and without considerable heart failure, no functional murmurs may be present. From such considerations as these we are forced to the conclusion that the mechanism which produces the murmur is something apart from that which provokes dilatation of the heart. The view so widely held that these systolic functional murmurs indicate regurgitation, and that in consequence there is a danger of this regurgitation embarrassing the heart and leading to heart failure, is merely an outcome of the back pressure theory and has no existence in fact.

(c) *The Condition of the Functional Efficiency of the Heart.*—The best and most accurate, and, in fact, the only reliable method of estimating the condition of the heart muscle is to acquire a knowledge of its efficiency, and, if it be inefficient, the extent of its limitation. This method consists in finding out how the heart responds to effort and recognizing the symptoms which indicate its exhaustion. In the limited time at my command I cannot enter into a description of the physiological principles involved in this method of estimating the state of the heart muscle, nor of the manner in which the symptoms are evoked. I shall only state that the chief symptoms are subjective, the individual himself being conscious of his limitations. This method may seem to you to be so obvious as not to need mentioning, but it is probably because it is so commonplace that its importance has never been appreciated. It may also seem so simple that any one can apply it; on the contrary the symptoms are at times so subtle and elusive that it requires very careful investigation before they can be appreciated. So many subjective sensations are connected with the circulation that it requires the most careful discrimination to find out those which are indicative of an exhausted muscle.

There is no doubt that many physicians have learnt from their own experience what I am endeavouring to place before you, but this knowledge is not conveyed with such precision and detail as to make their meaning clear. Thus, until recent methods were employed, the different forms of irregularity were never even classified on a basis of the slightest value for practical purposes. The method of estimating the heart's strength by testing the functional efficiency, which is the most essential part in every examination, has been to a great extent neglected. In proof of this, consider the insurance certificate which medical men fill up. All the questions are restricted to the physical examination and not one directed to finding out the functional efficiency of the organ, by which only the facts which are essential to a prognosis of the heart's condition can be ascertained. Notwithstanding, the books which are supposed to guide the medical examiner give no hint that such a method exists. The result is that I have seen individuals accepted at normal rates because a physical examination revealed no abnormality, whereas if an inquiry had been directed to the functional efficiency of the heart, the symptoms of exhaustion which heralded the unexpected death of the individual would have been revealed. On the other hand, I frequently see individuals rejected for life insurance because of the presence of some harmless manifestations, whose significance the examiner did not understand, and whose value he could not appreciate, simply because he failed to apply and to appreciate this method of testing the heart's efficiency.

The Method of Teaching Cardiac Symptomatology at Fault.

Probably the whole error arises from the manner in which the student is taught when he passes into the

medical wards. Here he is handed over for instruction in the physical signs to a clinical tutor, a teacher whose knowledge is so little in advance of his own that he does not understand the significance of the facts which he teaches. Under the care of this clinical tutor, at a time when he is most susceptible to impressions, he has hammered into him a certain kind of knowledge which remains with him and influences him during the remainder of his life. Thus, he is taught how to recognize the sounds of the heart, the size of the heart and its rate and rhythm, and what is supposed to be the normal in a healthy individual. Then he is shown, as a contrast, diseased conditions, with murmurs and muffled sounds, hearts of varying sizes, rates, and rhythm. Consciously or unconsciously, he gets the idea that a heart to be healthy must be of a certain size, the sounds clear and free from murmurs, and the rate regular. This idea may be sought to be modified by more experienced teachers later on, but I am certain that every medical man who passes out of his hospital training does so with a false conception of the nature of phenomena which a healthy heart can exhibit. How this works out in after-life I will show you immediately.

How this Imperfect Teaching Affects the Practitioner in his Work.

You may think I am dealing at too great length with the part which the medical man plays, but if we wish to appreciate the full consequence of our errors and misconceptions, we must know how they have arisen. In order to bring before you more clearly the significance of what I am trying to prove to you, I will refer to my own experiences. Some ten or fifteen years ago there arose a strange notion of the dangers of athleticism in school-boys and college youths. I think this originated in London, but at all events it speedily spread over the face of the earth. Exponents of the idea did not limit their views to the medical press, but, if I remember aright, warnings were written in the lay press by some of our learned colleagues. So widespread did this doctrine become, that great numbers of boys returned to school with certificates of unfitness to play the usual games, to such an extent that in some schools one half of the boys were supposed to suffer from impaired hearts. At this time I was pursuing my work in an isolated town in the north, and I wondered what were the symptoms by which these enfeebled hearts were recognized, and what were the evidences of an athlete's heart. My boys played strenuous games and entered into occupations entailing severe bodily labour, but I never saw any of them unfit unless they had manifest disease of the heart. It was not until I came to London five years ago that the real solution dawned upon me. The first consultation which I had in London was concerning a young girl who had fainted. She lived in the country, and a London physician was called in, who recognized some form of heart abnormality, and had her removed to London to undergo a course of what is called Naheim treatment. She had had two courses and had been under treatment for three months when I was asked if I could suggest any remedy for this intractable complaint. Judge of my surprise when I was told that the only evidence of disease was a persistent irregular action of the heart, which I found to be the youthful type of irregularity—a phenomenon so far from being a sign of disease is, as I have told you already, presumptive evidence of a perfectly healthy heart. From this time onwards young folks were brought to me in increasing numbers, until I have seen a very large number of youths who were supposed to have athletic hearts, or were supposed to be unfit to play games or to row, because of some impairment of the heart. Except in a few instances of manifest heart disease, the evidence on which the heart's impairment was based was those manifestations of murmurs or irregularity which my experience had shown to be perfectly consistent with a healthy heart. In addition, I have seen a great many youths who have been rejected for life insurance and for the services, and other

occupations which entail a preliminary medical examination, because of the presence of these manifestations of a healthy heart.

In my communications with medical men I have found the notion that a murmur or an irregularity is an evidence of disease so deeply rooted that it is simply impossible to get many of them to look at the evidences which point to the contrary. I have had a great deal of disagreeable correspondence with doctors after I have written to them about youths whose hearts I have pronounced healthy in spite of murmurs or irregular action. I have had replies to the effect that they have had great experience in this subject, and that they know I am wrong. I have asked such correspondents to recite to me the history of one single individual who has ever shown the slightest sign of heart failure, in whom these symptoms were found, and so far I have failed to get the history of a single case. Nay, more, although you will find in the writings of authorities grave warnings of the danger impending on youths who show these phenomena, yet I have failed to find the record of a single case in which these forebodings were realized. Considering how numerous are individuals showing these signs, and considering the strenuous games which are played and the strenuous lives that are lived, had these signs the gravity they are assumed to have, there would be on record many cases of heart failure, yet, as I say, literature is silent on the subject.

OBSERVATIONS UPON THE ACOUSTIC PHENOMENA IN MITRAL STENOSIS.

(Preliminary Communication.)

By THOMAS LEWIS, M.D.*

ASSISTANT PHYSICIAN, UNIVERSITY COLLEGE HOSPITAL.

Method.

SIMULTANEOUS electrocardiogram and heart sound record are taken, the latter by means of a microphone and separate string galvanometer. The two curves lie side by side on the same photographic plate, and the time relations of first and second sounds and murmurs

Fig. 1.—Simultaneous electrocardiogram and heart sound record. The upper curve shows, P, the auricular summit, and Q, R, S and T, the ventricular deflections. A hard vertical line is drawn at the commencement of systole; a dotted vertical line at the commencement of ventricular diastole. The lower curve shows the heart sound record: 1 = the first heart sound; 2 = the second heart sound; M = diastolic murmur. Taken from a case of mitral stenosis.

to the separate deflections of the electrocardiogram are calculated (Fig. 1).

Observations.

Preliminary observations, with a view to determining the time relation of the sounds at the apex beat to the electrocardiogram, were first undertaken in fifteen normal subjects.

1. The time relation of the normal first sound to the initial deflections of ventricular systole is variable. It may commence within 0.011 sec. of Q or within 0.002 sec. of R, or it may be delayed until 0.026 sec. after R or 0.039 sec. after Q. Usually it begins a little before or after the summit of R.

2. The time relation of the normal second sound at the apex to T, the last electrocardiographic deflection, is variable also. It may commence 0.01 or even 0.03 sec.

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