nephritic kidney were identical; he included both as "an actual nephritis of arthritic origin"; and confusion of arterio-sclerotic renal atrophy with the nephritis of "Granular Kidney" is still too common. The decrescent arterio-sclerotic process, in such patients, Ziegler demonstrated in the other parts of the body also, characteristically in the pancreas. Ewald, in 1881, virtually agreed with Ziegler, and pointed out moreover that in arterio-sclerosis the vascular change and the consequences of this kind may be found in many organs while the kidneys may be but little affected or even unaffected. It was this interpretation that Dr. West, in the Lettsomian Lectures already quoted, accepted, and pursued. He "excluded from the category of granular kidney certain . . . degenerated kidneys . . . in advanced atheromatous disease, and in the chronic gout of elderly persons . . . kidneys often marked by interstitial change, and often not small, but large; and not running the clinical course of granular kidney." Thus Dr. West emphasized the axiom that in the name "Granular Kidney" the adjective is not the mere superficial glance of a morbid anatomist, but is the name of a certain disease regarded in its processes and conditions, clinical and pathological, as a whole. Again, of the fibrous kidneys thus reckoned at random as "granular" Dr. Rolleston says:*

They are in the great majority of cases the result of atrophy from diminished blood supply, depending upon arterio-sclerosis of the renal arteries . . . where this is most marked there the tubules and glomeruli are most atrophied and the harder fibrous tissue takes its place.

Recently, again, Dr. Rose Bradford writes¹⁴ emphatically that in spite of occasional transition forms, and of some obscurities of pathogeny, the true granular kidney is to be distinguished from the arterio-sclerotic kidney; and he also relies chiefly on the clinical course. Senator, to whose excellent book there is, unfortunately, no subject index, on pp. 117 and 291 et seq., admits that the contracted kidney of irritative origin is to be discriminated from the arterio-sclerotic (*Nierensklerose*). Adami and Nichols¹⁵ likewise consider the arterio-sclerotic kidney as etiologically and clinically different from the granular, although on the *post-mortem* table the difference may not, so far as the kidneys go, be easy to define. Thus, of shrunken kidneys, these authors distinguish four—the two forms of small white, the granular form, and the arterio-sclerotic. In the arterio-sclerotic they agree that an atrophic, scarcely toxic, process is concerned. Eichhorst, in the sixth edition of his textbook, is rather confused among the many shrunken kidneys, but agrees that the distinction of the granular and the arterio-sclerosis forms rests upon the clinical history. Aschoff is of the same opinion;¹⁶ he gives an excellent figure of the arterio-sclerotic form, pointing out that it arises from atherosclerosis of extrarenal origin, and traces its origin in the advancing alterations of age, in the presence of atherosclerosis in other areas, and so on. He also describes in granular kidney the primary arterio-sclerosis of its fine inner vessels, and the later appearance of general atherosclerosis. Fahr of Hamburg¹⁷ says that in the kidney arterio-sclerosis frequently reaches high degrees, even causing much shrinkage of the organ, with little harm to its parenchyma. Jores and his school lack the clinical clues—he cannot get clear himself of anatomical ruins; again and again he betrays some unfamiliarity with those terms of morbid series, motley and long processions which merge ultimately in a common dissolution; as for instance, when he, and some other authors, say that, as general arterio-sclerosis penetrates to the finer vessels of the kidney, the case becomes one of renal disease. We note in another paragraph a like confusion of kind, when albuminuric retinitis is identified with simple arterio-sclerosis of the retinal vessels; the erroneous assumption here also being that when arterio-sclerosis penetrates to the retinal arteries the result is "albuminuric retinitis." And in the lists of cases published by himself, Prym, and Roth, the physician perceives that from a clinical point of view a more discriminating collection might have been made. I trust that I have made so manifest our gratitude to Jores for his accomplished work on arterio-sclerosis, that I may venture to enter a caveat on a side of the subject on which he does not, I believe, profess to

be an expert. The difficulty of disentangling these states on necropsy is admitted; especially, for instance, in cases of granular kidney arising in persons of mature age in whom general arterio-sclerosis had made some independent progress.

When, therefore, morbid anatomists have to speak of these rough fibrosed kidneys they must use a less equivocal adjective, one not already earmarked in the sphere of the physician. It would have been more convenient if the physician had provided the disease with some other name—one not seeming to apply only to a certain surface resemblance of many kidneys diverse in nature; however, the name "Granular Kidney"—not "Granular Kidneys" in the plural—will probably persist; and it has at any rate the advantage of not committing us to any frail hypothesis concerning the nature of the disease.†

Nevertheless, it may be reasonably argued that, if many units are obsolete in function, it matters little whether this destruction be due to occlusion or to a chronic inflammation. Yet of this demur I think that certain qualifications are necessary; we have seen that endarteritis obliterans, an irritative process, makes more surely for complete vascular occlusion than does arterio-sclerosis. Furthermore, it is here that we find ourselves faced by the farther question of the nature and incidence of a hypothetical toxin behind Granular Kidney, and whether such toxin confines itself to raiding its vessels, or attacks the connective tissue and the parenchyma also. I have always suspected that in the foci of the red granular organ the parenchyma suffers directly and by some process more corrosive than mere withering. For instance, the plumbous kidney, which smoulders into the granular kidney, if caught in an early stage, presents—so Sir Thomas Oliver informs us—a universal parenchymatous affection, as seen first in cloudy swelling of the epithelium. It seems to me, then, that, although in a state of ultimate wreck, such original differences of nature may be erased, yet that the red granular kidney is the result of some process more virulent than an atrophy. Notwithstanding, as small fractional parts of healthy kidney structure will suffice for life, the focal distribution of its virulence enables the kidneys to keep at work for long periods without serious breakdown, and thus the disease often lies latent for years.

(To be continued.)

The Oliver-Sharpey Lectures ON HEART FAILURE.

DELIVERED BEFORE THE ROYAL COLLEGE OF PHYSICIANS
OF LONDON,

BY

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LECTURE II.—THE ESTIMATION OF HEART FAILURE AND
THE SIGNIFICANCE OF SYMPTOMS.

In this lecture I wish to place before you the method of estimating the degree of heart failure and of determining the significance of symptoms which I have employed for several years.

Before dealing more particularly with the method and its application, I shall first describe, in broad outline, the nature of the heart's force, the manner of its exhaustion, and the way in which symptoms are produced.

The Essential Factors in Maintaining the Circulation.

The function of the circulation is the supply to the tissues of a material capable of nourishing them, and the removal of such waste products as can enter the circulation. The heart and blood vessels are constructed specially to favour this object. The heart muscle supplies the force which maintains the circulation, and the blood

* In a discussion of a paper of mine at the Medico-Chirurgical Society January, 1903 (vide *Med.-Chir. Trans.*, vol. lxxxvi).

† For differentiation of syphilitic renal fibrosis, see J. Rose Bradford, Croonian Lecture, 1904; and Loomis, *New York Path. Soc. Trans.*, 1889.

vessels are so constructed as to facilitate the work of the heart. Any disturbance in that adjustment must at once entail more work upon the heart muscle, inasmuch as a departure from the normal means the embarrassment of the heart in its work. From this consideration it will be seen that the essential factor in maintaining the circulation is the heart muscle, and any process of disease in the heart or blood vessels impairs the circulation by embarrassing the heart muscle in its work.

The Nature of the Heart's Functions.

As the heart possesses the power of varying its activity according to the bodily requirements, the force inherent in the heart muscle may be considered, for practical purposes, to be composed of two parts—namely, a part which is employed to maintain an efficient circulation when the body is at rest, and which, therefore, may be called the "rest force." The rest force is the minimal force which the heart can exert to maintain the circulation at a level consistent with life; an impairment of it leads inevitably to a fatal issue. The second part of the heart's force is that which is called upon when the body makes some effort. While the body is at rest this potential force is not exercised, but its existence enables us to undertake with ease all forms of effort. Inasmuch as this part of the heart's force is only used when exertion is made, it may appropriately be called the "work force" of the heart.

The Bearing of Disease Processes on the Heart's Work.

The reason for this division of the heart's power into the rest force and work force is that it enables us to understand better what constitutes heart failure. When we reflect that any disturbance of the circulatory mechanism leads to an embarrassment of the heart muscle in its work, we shall realize that heart failure means inability of the heart muscle to overcome successfully the obstacles opposing it in its work. The disturbances of the circulatory mechanism may be of a very varied character, and may arise from a great number of causes, and it is from the standpoint of possible obstacles to the heart muscle in its work that the bearing of all seeming abnormalities should be considered. Thus valvular defects should be studied, not as specific affections in themselves, but as sources of embarrassment of the heart muscle in its work, or as indications of disease which may have extended to and damaged the walls of the heart or blood vessels, for example, the aorta or coronary arteries. In like manner irregular action of the heart should be considered as to whether the irregular or inco-ordinate contraction of the chambers embarrasses the heart in its work, or whether its cause impairs the heart's efficient working. Arterial degeneration and high blood pressure, while requiring full consideration, should be viewed, so far as the heart is concerned, as agents tending to upset the normal adjustment of the factors which carry on the circulation, or as evidence of disease, which may affect the heart muscle or its blood vessels. The possibility of inherent defects in the muscle wall itself should be considered in all cases, as they naturally have a most important bearing on the heart's efficiency. In this connexion, insufficient or improper food, overwork, bodily or mental, too little time given for rest and restoration of the heart's strength, worry and sleeplessness, the reaction of the nervous system and other organs upon the heart, should all be taken into account when the factors producing heart failure are being considered.

How Heart Failure Begins.

Bearing in mind the division that I have given of the heart's power, it will be found that heart failure invariably starts in the first instance by exhaustion of the work force. The exhaustion is slight at first, but by the persistence of the causal factors it proceeds apace, until after a period, long or short, the exhaustion induces such distress as to compel attention, or the rest force is encroached upon, and with the exhaustion of the rest force a point of danger to the life of the individual is reached.

The Relationship between Exhaustion and Restoration of the Work Force of the Heart.

From this conception of the exhaustion of the heart's strength we can perceive the manner in which heart failure arises. The daily routine of a man accustomed

to bodily labour shows a period of rest and a period of work, the one balancing the other—the period of exhaustion of the work force requiring a sufficient period of repose for its restoration. The life of man is so marked out that each day's work is roughly estimated by what a healthy man can do. If an individual has to do the work of a healthy man, but is hampered by some inherent defect, his work force is more speedily exhausted, and he needs a longer period for recuperation. If this is not obtained, then in course of time exhaustion increases, and the period of rest becomes less efficient and heart failure sets in. In the first instance, then, heart failure is no more than the inability of the heart to regain sufficient work force during its periods of rest. The rate at which heart failure progresses depends on the unequal relation between the bodily exertion and the amount of rest. The agents embarrassing the heart in its work need not necessarily be of cardiac origin; it may be the blood vessels, or diseases of other systems, or it may be due to some bodily condition, as obesity. When it is a heart lesion which embarrasses the heart in its work, the failure should not necessarily be considered as due to the heart lesion, but due to the individual attempting to do a healthy man's work handicapped by his defect. In the recognition of this fact we get the clue, not only to the cause of the heart failure, but a reasonable suggestion as to its rational treatment.

The Nature of the Symptoms in Visceral Disease.

Before dealing with the method by which we recognize heart failure, I will take the opportunity of presenting briefly to you a view of the symptomatology of visceral disease, which enables us to get a clear idea of the nature of symptoms. Visceral disease is made manifest to us by a series of phenomena, which can be separated into three distinct groups:

1. Symptoms due to changes in the organ itself, as alteration in its size, its shape, and, in the case of the circulatory system, in the rate and rhythm of the heart movements, and of the state of the vessels.

2. Symptoms due to impaired function, shown, it may be, in other tissues and organs, as in the case of heart affections, where syncope may arise from deficient supply of blood to the brain.

3. Symptoms due to reflex stimulation of other systems. This last class of symptoms includes, in the main, a series of phenomena which may be considered protective in their functions, and it is more particularly to these that I would desire to draw attention.

All organs of the body are endowed with a protective mechanism, which operates by calling into activity the functions of other systems. The immediate cause of this awakening of the protective mechanism is the exhaustion or disturbance of the function of the organ. The evidence for this view of symptoms may be best studied in affections of the heart. If, for instance, we wish to get an idea of how the heart performs its work, we shall find the best evidence in the study of the class of symptoms included in this group. When exhaustion sets in the first sign is given by some sensation of distress. This sensation arises by calling into play some part of the nervous system. The sensations may be of varied character, as a sense of exhaustion, choking sensation in the throat, tightness across the chest, dyspnoea, or pain. When such sensations arise during effort they act as an imperative call to desist from further exertion. When, then, we seek to estimate the condition of the work force, we find a guide as to its amount by estimating the response of the individual to effort. Exhaustion of a healthy heart will produce symptoms identical with a diseased heart, and the difference is only in the ease with which these symptoms are induced, or, in other words, in the amount of the work force. Hence as the appearance of certain symptoms indicates the exhaustion of the work force, we can gather from these symptoms the amount of work force which the heart possesses. The first evidence of heart failure is invariably a subjective one, although it may be ignored for a time. The patient's attention is drawn first to his condition by some feeling of distress in the performance of some act which he was wont to undertake without discomfort. It is the limitation of the field of cardiac response, with the interposition of the protective

mechanism, which is the first and dominant sign in all forms of heart failure, and it is by the due appreciation of the patient's sensations that the physician obtains the most reliable information about the condition of the heart's strength.

The Standard for Estimating the Heart's Strength.

The standard by which the heart's strength is measured is peculiar to the individual. The field of response to effort varies widely in different individuals with healthy hearts. Each one knows the amount of effort he can put forth without distress, and this is the only practical standard. It is the appreciation of this fact, that distress is evoked prematurely, that indicates the beginning of heart failure. The kind of distress called forth varies: breathlessness, palpitation, a sense of exhaustion, suffocation or pain, are the most common sensations experienced. By the time objective signs of heart failure have arisen, such as dropsy, laboured breathing when at rest or after slight exertion, increased rate, dilatation, the heart failure has proceeded a long way. When such objective signs persist when the body is at rest, the work force is practically expended, and the rest force is being exhausted.

Estimation of the Significance of Symptoms.

From this conception of heart failure and the manner by which symptoms of heart failure arise, we are able to set a standard by which the significance of symptoms may be estimated. The simple test is to observe how the heart responds to effort. It is manifest that if a heart be handicapped exhaustion will occur prematurely. It is necessary, therefore, that evidences of premature exhaustion should be sought for. As I have said, the standard of response is a personal one, no two healthy men responding exactly alike. It is necessary to be able to discriminate the relative strength of different individuals before applying this method of estimation, and it is in this connexion that great judgement should be exercised. If there be present in the heart some abnormal sign, as an increase in the size, a murmur, or an irregularity, but with no limitation of the field of cardiac response, it may be taken for granted that the cause of the abnormal sign has not impaired the functional efficiency of the heart muscle, and therefore that it is of little significance so far as heart failure is concerned. When there is marked restriction of the field of cardiac response, and the individual presents some abnormality, it does not necessarily follow that the cause of the abnormality is the cause of the heart failure. A careful inquiry has to be made into other circumstances, such as proper food supply, other affections of the body, overwork, worry, sleeplessness, and so forth. Many individuals suffer from extreme heart failure who never show any objective sign, the heart's action and size agreeing in every respect with our conception of what is normal. But if this method of estimating the condition of the work force be followed, symptoms of a characteristic kind will be found that will show the extent of the heart failure, and warn the physician when danger is impending.

Neglect of the Significance of the Protective Phenomena.

In putting forth this view that heart failure can be detected and that the significance of symptoms can be estimated by the observance of how the heart responds to effort, I make no pretence to originality. It was Graham Steell who pointed out to me many years ago the great significance of "muscle failure." Practically every one is willing to admit the truth of the proposition that it is the inability of the muscle to maintain an efficient circulation which is the cause of heart failure. But it is necessary to insist upon it here, for, though every one may admit it, few think it worth while to look at heart failure from this point of view. At all events, the testing of the heart's efficiency, by observing how the heart responds to effort, is never taught. If we were to seek in textbooks for a method to estimate the value of a symptom, we should find most writers so vague that one could read a large volume and rise from it with no notion of how the author would estimate the value of the simplest phenomenon. When writers do offer advice as to the estimation of the value of any symptom, they may go so far as to say that an opinion should not be based on the symptom alone, but that a decision should be given after inspection, palpation, percussion, and auscultation. That is to say, every

possible means should be taken except the one of real importance. If we look further, we shall find how this very commonplace method is ignored. I have already referred to the methods in the army, where an individual is rejected merely on account of the presence of a murmur or an irregularity. Look at the questions in an insurance paper: "Are the heart sounds free from murmurs?" "Is the heart regular in its action?" Not a word as to the essential symptoms of heart failure. When a murmur or an irregularity is noted, some insurance offices have what they call a "heart form" to fill in, which is so arranged that the essential symptoms that would lead to an intelligent appreciation of the value of the abnormal symptom are practically neglected.

Inadequacy of Methods Usually Employed to Estimate the Heart's Efficiency.

There have been many attempts made to find some reliable method which could be applied to the differentiation of the value of symptoms, by estimating the integrity of the heart. Attempts have been made by counting the heart beats after a short period of violent exertion—a method which is of little use, except in rare cases, and which is full of fallacies and liable to mislead. Instrumental methods appeal so strongly to the imagination that we have attempted methods of valuation which are based entirely on a misconception of what it is they should reveal. We have elaborate blood pressure instruments, supposed to show the co-efficiency of the heart's strength in the terms of a mathematical formula. We have graphic records, and even the electrocardiograph. I am the last to decry the use of these methods, for they all have a very important sphere of usefulness, but I have little hesitation in saying that as a means of estimating the heart's integrity and capacity and elucidating the significance of symptoms they can only supply a very limited amount of information. When we reflect as to what are the essential conditions which lead to heart failure we shall at once recognize the great limitations of all methods which depend on the use of mechanical contrivances. Further, seeing that heart failure is first exhibited by a diminution of the work force of the heart, and that this is shown by a restriction of the field of effort, it will be understood how insufficient all methods are which depend on the examination of the body at rest.

The Importance of Subjective Sensations.

On the other hand, the due perception of the symptoms which arise in the early stages of heart failure, and their modification as exhaustion of the work force of the heart proceeds, furnishes evidence of such value that we can estimate not only the degree of heart failure, but the significance of any objective sign which may be found. For this purpose it is necessary that we should recognize the symptoms, and, as they are in the main subjective, their appreciation is surrounded with many difficulties. When we reflect on the enormous amount of time that has been spent in the elucidation of many of the signs revealed by physical examination, and the indifference with which subjective symptoms have been treated, we shall realize how it has come about that the estimation of the value of symptoms has been so inadequate. Many of the most significant symptoms are ignored in the examination of patients, and few are properly understood. Such a striking phenomenon as breathlessness, a symptom so prominent that neither physician nor patient can overlook it, is still so obscure that we have little knowledge of its varied forms and the mechanism of their production, and in consequence we lose the significance of each form. In like manner, the most dominant of symptoms—pain, a symptom so instructive and universal in its occurrence—has never been appreciated. Even at this day we know little of its mechanism, and because it is a subjective symptom and one which the physician cannot recognize by mechanical methods, its presence receives but the slightest consideration. The result is that this most instructive symptom is banished as a phantasy or labelled as a pseudo-angina pectoris, or exaggerated into a symptom of the most dreadful kind. I think there is nothing so futile and so misleading in clinical medicine as the usual description of pain in affections of the heart. The same neglect is shown in regard to the sensory phenomena associated with pain—for example, the hyperalgesia of the

external body wall, the sense of compression of the chest, the feeling of suffocation in the throat. These phenomena, when present singly or two or more together, are frequently the only grounds on which a safe opinion can be based. There is another series of sensations caused by the action of the heart, which would be of the greatest help if we understood them. At present the cause of many heart affections cannot be detected because certain changes in the heart's rhythm occur at infrequent times. If we but appreciated the patient's sensations we should often be able to recognize the condition that caused the distress. When opportunity is offered, it will be found that such sensations as "fluttering of the heart," the "sensation of stoppage," and the "thumping sensation" are due to very distinct and definite changes in the heart's action.

Method of Examination.

In applying this method of estimating the value of symptoms, I insist upon the patient's describing his own sensations and all attendant circumstances minutely. I carefully inquire into the manner in which an individual presenting any abnormal sign accomplishes his daily work or play. If he is young, how he comports himself during effort, as in playing some game or running a race; if he is middle-aged or elderly, how he carries out his work, and also how he may be able to undertake some effort. I try to ascertain if he can do the work and effort of a healthy man at his time of life, and if the inquiry satisfies me that he can do them, I give him a good prognosis. In doing this, I am testing the amount of work force, and if I find that even with a recognizable defect the individual does lead a healthy, untrammelled life, then I know that I have to do with an efficient heart muscle, and the defect is so slight that it does not perceptibly embarrass the heart in its work. When there is any limitation of this power, then a careful scrutiny is made into all the possible factors, such as overwork, worry, sleeplessness, and other diseases, which may induce exhaustion of the work force. If, in addition, there be any manifest lesion, then its bearing on heart failure is carefully considered to see whether its presence is merely incidental or whether it is a progressive lesion, or again whether it is stationary, but its presence has handicapped the heart in its work.

It may be as well to bring out the value of this method by showing how I have utilized it in actual practice. In the young with the functional murmurs and irregularities which I have already mentioned the individual's account of how he plays his games and reacts to effort is generally easy to ascertain. The consciousness of any distressful feeling too easily induced will be sufficient to place the physician on his guard, lest there be some actual enfeeblement present. The presence of an irregular action, as that due to an extrasystole, may cause a good deal of mental distress to the individual by his consciousness of the heart's abnormal action. Recognition of the kind of irregularity and the knowledge attained from long experience showing that it may not be in itself a sign indicative of heart failure, enables us to reassure the patient with confidence. For instance, I had referred to me a professional football player, a young athletic man of 21, who was greatly distressed by an unpleasant feeling in his heart at times. He had been examined by two doctors, who had recognized an occasional irregularity in the heart's action. He had been forbidden to exert himself, and was given digitalis and strychnine. After three weeks' rest and treatment the occurrence of the distressful feeling continued unabated. When I examined him I found his uneasy sensations were due to the occurrence of extrasystoles. In all other respects he appeared a perfectly healthy man, his response to effort being good, for he played his game vigorously up to the time he had been told to rest. In consequence of being told to cease work because of his heart's abnormal action he had become depressed and apprehensive. I endeavoured to reassure him, and suggested that all treatment should be stopped, and that he should start playing football again, and if at any time he was conscious of his heart stopping he was to pay no attention to it. He at once resumed his engagements, and completed his term with no discomfort. He told me that at the beginning of one match he was painfully conscious of his heart's irregularity, and felt that he must retire; but, reflecting upon what I had told him, he dashed into the game, and in a

few minutes forgot all about his trouble, and he said that he never played a better game in his life. I may add that I have seen individuals, young and middle aged, in whom extrasystoles occurred at intervals, and have watched them for years, and have never seen any one who was restricted in his work on their account.

The same line of observation, when applied to what are usually called cases of valvular disease, will reveal features of real significance. The manner in which the individual responds to effort will be found to enable us to recognize those in whom the heart muscle has escaped damage, and those in whom the disease is gradually and surely extending, impairing the functional efficiency of the muscle, and embarrassing it in its work by interference with the flow of blood.

In searching for information in regard to the significance of murmurs, while the appreciation of how the heart responds to effort may give information as to the integrity of the heart muscle, where it has escaped damage, it requires very careful inquiry to realize the extent of the damage when the heart's efficiency is impaired. The degree of limitation of the field of cardiac response to effort must be correlated to the changes revealed in the heart by physical examination, and an estimate formed in regard to the rate of progress when the lesion is not stationary. This entails an inquiry into the history of the patient to find the date of the initial infection, and an estimate of the extent of the changes and the rate at which they have progressed from the evidence afforded by a physical examination. Thus, for instance, in mitral stenosis, the date at which the lesion began may be referred to an attack of rheumatic fever some years previously. Recognizing that mitral stenosis does not arise as an acute condition, except when due to vegetations on the valves, but is the result of a process that proceeds at a varying rate in different individuals, we can get fairly trustworthy evidence by the character of the murmur. As the narrowing of the orifice proceeds, we shall find changes occurring—first it may be a thrill, presystolic in time, then after a period, it may be of years, we find a presystolic murmur, which becomes more and more accentuated and prolonged as the narrowing goes on. The mitral orifice still becoming narrower produces a diastolic murmur, short at first, but gradually becoming lengthened, until the whole diastole is filled by murmurs. In these stages a reference back to the primary infection gives an idea of the rate of progress. Coincident changes, affecting the heart muscle, may be appreciated by noting the response to effort and changes in the size of the heart, and finally in the presence of auricular fibrillation. It will be found that in all these cases there is a distinct relation between the amount of work force and the degree of impairment of the heart's efficiency, due to the lesion in the muscle and valves.

I find this method of valuation of the greatest service also in cases of angina pectoris. If the statement which I have placed before you is accepted—that the only real test of the integrity of the heart muscle is its power to respond to effort, and that the amount of effort that can be undertaken without distress affords a basis for estimating the degree of impairment—we are at once placed in a position to obtain a fair conception of the gravity of any case of angina pectoris. Some men between 50 and 60 years of age, who are actively engaged in business, are seized with all the typical symptoms of angina pectoris. Recognizing how anxiously this condition is viewed, it is necessary to form an opinion as to the gravity of the condition. Putting aside all theoretical considerations as to the manner of the production of angina, let us consider it from a useful and practical point of view. If we look upon the sensations in angina pectoris as being in its nature a part of the protective mechanism, and the evidence of an exhausted heart muscle, however this exhaustion may have been induced, we obtain the grounds for a reasonable prognosis and a sensible line of treatment. In all people, as years advance, changes of a degenerative nature occur. So far as the heart is concerned, these may take place apart from any conspicuous lesion. On inquiry we shall find almost to a certainty that the attack of angina is not the first sign of heart exhaustion. If closely interrogated patients will invariably reveal that some time previously, even five or ten years before, they were conscious at times of sensations of a disagreeable kind on exertion, which they ignored,

continuing their work. These sensations indicated that at that time the periods of rest were not sufficient to restore the exhausted muscle, and that even then some slight changes were going on in the muscle which impaired its efficiency. With this impairment the individual still worked as hard as when in the flush and vigour of manhood. Exhaustion, in the first instance being ignored, finally becomes so extreme that it culminates in an attack of angina pectoris. If this view be acted upon, and if it be recognized that the muscle is exhausted because the periods of rest are not sufficient to restore the work force, we find out the essential cause of the suffering. It is necessary to recognize whether the conditions producing the attack are removable or permanent. A careful investigation may reveal that excessive work, worry, or sleeplessness has prevented recuperation. On the other hand, other factors may have contributed to the heart's embarrassment, such as poisoning from tobacco or alcohol. By the removal of these causes the heart may be restored to such efficiency that the individual leads a useful life at a lower level, with a prospect of attaining the allotted span. If the degenerative changes inducing the attack are more advanced, then it will be found that the recovery is partial and delayed, so that the degree of recovery is often an indication of the actual damage to the heart muscle. In other cases of angina pectoris—such, for instance, as when the attacks are readily provoked by exertion after meals—a due appreciation of the functional activity of the heart will be helpful. In some cases, when the attacks come on after a meal, the individual cannot at first walk fifty or one hundred yards without being distressed. This may be repeated a few times, and then he may be able to walk five or ten miles with no distress. This fact indicates that there is a good deal of healthy heart muscle present, and that the attacks are provoked by the introduction of an additional factor—a full stomach—which embarrasses the heart for the time being.

Auricular fibrillation is a condition that not infrequently induces an extreme amount of heart failure, which may speedily terminate in death. In such cases the exhaustion is so readily induced that no one could overlook the gravity of the condition. On the other hand, we find all degrees of limitation, some patients having little or no limitation of the field of cardiac response. The extreme irregularity in these cases is often viewed with alarm, but there are evidences present in every case which enable a proper estimate to be formed, such as the rate, the presence or absence of objective signs of heart failure. In the absence of such objective signs, the manner in which the individual responds to effort will invariably indicate how far the heart muscle is able to overcome the embarrassment induced by the irregular action, and the extent which the patient can exert himself within the limits which cause distress will afford a valuable indication as to the state of the heart muscle.

Limitations of the Method.

I do not pretend that this view of estimating the degree of heart failure is of universal application, for there are many heart affections to which it is not applicable, as in acute diseases, or when the heart is invaded by some microbe or toxin, or where the individual has been weakened from some other ailment, as the various anaemias. It is mainly applicable to chronic cases with gradual changes impairing the capacity of the organ, and it is useful in differentiating those symptoms which have a serious bearing from those with little or no significance. Further consideration may reveal its unsuitability in other ways, and may lead to its modification. Such a view as this cannot be tried and judged on theoretical grounds or by the testing of a few cases for a brief period, but must be carefully applied to a large number of individuals, and those individuals watched and examined at intervals over periods extending from twenty to thirty years.

Since this view only impressed itself upon me ten or fifteen years ago, it will be seen that I cannot have given it that thorough test which it requires. It has, however, revealed so much to me and has been of so much practical help that I feel justified in putting it forward, for the life and experience of one observer is too limited to settle a matter of this importance.

Treatment.

The conception of heart failure and the method of estimating the value of symptoms which I have attempted to describe has been of the greatest value to me in treating patients with heart affections, and in elucidating the action of remedies in a research which I have been carrying on for some time. Pursuing my work until lately amongst individuals most of whom were actively engaged in manual labour, the subject of treatment was all important, as they would not desist from work unless actually compelled by force of circumstances. I therefore saw many people whom on theoretical grounds I considered unfit for work who continued their work in spite of warnings, and were little the worse. This caused me to look more carefully into the circumstances of each case, to find out why, for instance, hearts damaged by old rheumatic lesions were capable of so much work, and when I came to appreciate the reason there was also placed in my hands a reasonable line to follow in managing such cases during their temporary attacks of heart failure. Recognizing that the exhaustion of the heart was due to an insufficient period of rest, a full inquiry into all the patient's circumstances frequently led to the recognition of many events in the daily life which by modification would save the heart much exertion, while the business or work of the individual could still be continued.

From this arose the first and most important indication—namely, that an individual affected by a heart lesion which diminishes his work force must live within the limits of his powers. This can only be done by the period of rest being sufficient to restore the exhaustion of the work force. In this way alone will heart failure be avoided, and a reasonable prospect of longevity be attained.

Treatment need not be given in the presence of any abnormal conditions unless there is distinct evidence of heart exhaustion. Where there is such evidence, then the treatment in the first place must consider the possibility of diminishing the amount of daily effort.

From the point of view that heart failure arises because the period of work is so great that the period of rest cannot restore a sufficient amount of work force, the essential principle of treatment becomes self evident—namely, rest. Though the beneficial effects of rest are invariably acknowledged they are far from being sufficiently appreciated. When we scrutinize any system of treatment, it will be found that the success of the treatment depends entirely upon the amount of rest the heart has procured. It seems probable that drugs which have such a potent and beneficial effect upon the heart as those of the digitalis group owe their good effect mainly to the amount of rest procured by the slowing of the heart's rate. At all events, in the researches I have been carrying on for some years, the cases which have obtained the greatest benefit from the digitalis were those in which the heart's rate was decreased by the digitalis. I have repeatedly seen relapse of patients coincide with an increase in the pulse-rate when the digitalis was diminished or left off. The vast majority of patients in whom digitalis acts with such marvellous effect in slowing the rate and improving the condition are those affected by auricular fibrillation. The reason that digitalis has acquired such a reputation as a cardiac drug is due to the peculiar susceptibility of patients with auricular fibrillation, and practically all recorded cases illustrating the remarkable effects of digitalis are cases of auricular fibrillation. Hearts with the normal rhythm are seldom so sensitive to the digitalis, and in them there is not the same tendency to slowing of the rate.

While in all successful systems of treatment rest is always prescribed, its good results are not always recognized, because at the same time some special agent is employed, such as a drug, a bath, or an exercise, and the good results are attributed to the special agent. It is for this reason that the therapy of the heart affections is loaded by such an array of therapeutical measures, the vast majority of which have little or no effect on the heart. Many of these agents are not only given when rest has also been prescribed, but they are given when there is no heart failure, and only because the physician has detected some anomalous symptom. It is a matter of everyday experience to find individuals with a murmur or an irregularity, who for years have been subjected to treatment and

made to visit health resorts, for a condition which neither indicates heart failure in the present nor its likelihood in the future. The fact that heart failure did not arise has probably been attributed to the precautionary measures. From this comes the belief in the efficacy of many of the drugs and methods in use to-day. When many of these vaunted remedies are carefully investigated, their uselessness becomes evident. Take, for instance, the present-day belief in the efficacy of strychnine on the heart, a belief held not only by a great many physicians, but which exercises an almost superstitious regard in the mind of many of our surgical brethren, in whom the belief is so deeply rooted that they will not undertake an operation without the preliminary ceremonial rite of a hypodermic injection of strychnine. I have sought in vain for the slightest evidence of the effect of medicinal doses of strychnine upon the heart, and have searched the literature on the subject and have not found one single reliable instance demonstrating the effects of medicinal doses. Pharmacologists have repeatedly examined with the minutest care the effects of medicinal doses of strychnine upon the heart in experiment, and have failed to obtain a result of any kind. So it is with a great many other drugs and methods, with the unfortunate result that the effects of drugs that are really of service are never properly appreciated.

We might not care so much for these erroneous beliefs were it not that they blind the profession to the great want of suitable agents in treating real and serious affections of the heart. There are many conditions in which rest alone fails to benefit the heart, as when the heart is invaded by a toxin, or rendered irritable from some lesion in the heart itself, or when the ventricle in heart-block contracts so seldom as to endanger life. For these and many other conditions we are absolutely without any means of meeting the impending and actual danger, and yet we are kept in ignorance of this fact because writers pour forth a stream of remedies for any and every kind of heart trouble. Were we more alive to our own limitations we should be more industrious in the search for real and valuable remedies.

THE SURGICAL TREATMENT OF CHRONIC COLITIS.*

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CHRONIC colitis, like many other clinical terms, includes different conditions under a single heading. There is a colitis due to simple irritation of the bowel, a colitis due to protozoal infection, and another form due to bacteria. The surgeon, however, has no need of an elaborate classification, for he is called upon to treat only two classes of cases: those in which a cause can be found, and those where the patient is suffering from toxæmia due to the absorption of septic products from an ulcerating bowel, the cause of the ulceration being unknown.

The two conditions are liable to be mistaken in the early stages, and it is important, therefore, to make a thorough and methodical examination as soon as possible. A correct diagnosis cannot usually be arrived at in the out-patient room of a hospital or in the consulting room of the surgeon. The patient should, therefore, be kept in bed a day or two before any examination is made, and should be placed in charge of a competent nurse. The bowels should be emptied and cleansed by simple enemata and by irrigation with unirritating lotions. When this has been done thoroughly, digital examination, followed by the careful use of a sigmoidoscope, will often reveal a cause if the inflammation is limited to the rectum or the lower part of the sigmoid flexure. Abdominal palpation may give a clue when the cause is situated in the colon at a greater distance from the anus. Such a local examination will show that some cases of chronic inflammation of the bowel are due to gross causes. The colon may be irritated by the long-continued presence of scybala which have become packed away in the sacculi of the intestine, leaving the lumen free. The patient thus has a daily action of the bowels in spite of the impaction of faeces, and

the cause is only recognized when the irrigation brings away masses of foul-smelling faeces, and the irritation subsides. Local irritation, too, may be due to the presence of a polypus or of an unsuspected cancer of the rectum; more rarely it may be due to actinomycosis, to glanders, to tubercle, to some strain of pneumococcus, to gonorrhoea, or even to syphilis. I have also seen it in a few cases of pericolicitis where an abscess, formed outside the bowel, has afterwards burst into its lumen.

When these causes have been eliminated there remains a large class of cases which are grouped under the comprehensive heading of "ulcerative colitis," although there is no doubt that several subclasses of the disease exist. In these cases the large intestine may be ulcerated locally, or the inflammation may extend throughout its whole extent. The lesion is chronic, destructive and generally extensive. It rarely leads to perforation of the bowel; it is hardly ever associated with abscess of the liver; it kills by toxæmia. It occurs equally in men and in women, and although it occurs in epidemics, it is usually sporadic, as we see it in private and in hospital practice. The number of cases, I think, is increasing, but this may perhaps be due to the fact that I have been interested in the subject, and more cases therefore have been sent to me.

Local examination of a case of ulcerative colitis reveals no gross cause, and the inflammation requires for its investigation all the resources of modern bacteriology, and even then the pathologist may have to confess that he is without any clue to its nature.

During the last three years I have had ten cases of ulcerative colitis under my care, two of whom died. Here in brief is the record of a case, for the notes of which I am indebted to Dr. Ogier Ward, who was fortunate enough to have followed it from beginning to end:

A gentleman aged 30 first came under observation on October 5th, 1904, suffering from constipation. He said that his bowels had always been obstinate, but that they had become worse lately. Diet and the use of glycerine enemata relieved him until June 9th, 1905, when he returned complaining that for the last three weeks his bowels had again become irregular, and that he had seen blood in his stools. Examination showed that he was suffering from a fissure of the anus. The fissure was touched with caustic, and a week later the patient reported that he had not seen any more blood, but he was found to have four ulcers extending radially from the margin of the anus. Simple treatment caused the ulcers to heal, and the patient remained well until August 20th, 1906, when he applied for the relief of a pustular eruption on his hands which he thought he had contracted in the pursuit of his occupation as a buyer of furs. Rectal examination showed that he had a tiny fissure of the skin in the immediate neighbourhood of the anus.

He did not present himself again until March 10th, 1910, when an examination showed that the fissures were still present. There was no pain when the bowels were relieved, but blood spattered the pan of the closet. His bowels were very irregular, and the patient complained that when he had emptied them after breakfast it was often necessary for him to do so again within twenty minutes, the second motion being solid or liquid. He had slept well until the last week, when his sleep had been disturbed by the necessity of getting up to relieve his bowels. For instance, on the previous night he had a good stool at 2 a.m., but at 3 a.m. he was obliged to rise again to pass some watery stuff. He had lost his appetite and so much of his former vigour that he was unable to continue his business. It was noted that his teeth were very foul, and rectal examination showed that he had two small piles. On March 2nd the patient had passed blood and mucus three or four times by the bowel, and there was some spasm of the anus. The pulse was 105 and the temperature 99° F. On April 7th a well-marked fissure of the anus had formed, and there was some eversion of the margin, as though the external sphincter had lost its tone. The gums and mouth were in a much more healthy condition, and the patient was able to use a toothbrush. On April 18th the patient wrote complaining of "rheumatism" on the right side, and when he was seen on April 25th it was obvious that he was extremely ill. His pulse was 120, his temperature was 103.3° F., and he had had a rigor. He passed his motions frequently, the stools being crumbling and containing blood and mucus. The right wrist was swollen and red, and there was pain along the right sartorius muscle.

I saw him on April 28th, and found that he was passing stools containing blood clots and that he had a chronic ulceration extending from the margin of the anus upwards into the bowel. On May 11th he was seen by Dr. Hale White, who recommended that an appendicostomy should be done to ensure a better irrigation of the bowel, as it was clear that he was suffering from ulcerative colitis associated with profound toxæmia. This operation I performed on May 12th, and the bowel was washed out, whilst the patient was still under the anaesthetic, with three pints of hot saline solution. This was repeated daily, and the report states that on May 15th there was no longer any blood, pus, or mucus. The patient remained very ill, however, and he was given a vaccine prepared from his own pus. The

* Remarks introductory to a discussion on chronic colitis at the Harveian Society of London (see p. 874).