ducing the condition. That constriction of the smaller veins occurs irregularly when the shock is already well advanced, and the circulation is reduced to a slow trickle, was observed by Laidlaw and myself. The venules, properly so called, are shown by the microscopic observations of Hooker and of Rich, as well as by our own naked-eye description, to be dilated and full of blood. When once the peripheral stagnation has occurred, it is obvious that a constriction of the arteries, on the one hand, and of the veins on the other, if it occurs, will intensify the condition and render recovery from it more difficult; but I am still convinced that the primary and essential factor is the loss of the tone of the capillaries.

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ON LIMITATION OF EFFORT IN HEART DISEASE.*

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THIS subject is one on which medical opinion, both individual and collective, has never been uniform, and is by no means uniform now. Fifty years ago, while Oertel sent patients with serious heart disease to climb mountains, the general trend of practice was seriously to limit all who showed either murmurs or irregularities, let alone more obvious signs and symptoms; and it was further very generally assumed that once restricted meant always restricted.

Of late years murmurs have been perhaps too much discounted, for the pendulum is apt to swing, while the differentiation of the irregularities—which, apart from evidence of physiological efficiency, throws more light upon this question than any other single consideration—is as yet not fully comprehended except by those who have made it a special study. It is not a simple matter, and the busy practitioner welcomes something simple and easily recognized to guide him. And the latter-day specialists—or some of them—have given him a sign which seems easy enough to recognize, and which has to some extent replaced the systolic murmur. The sign is enlargement.

ENLARGEMENT OF THE HEART.

I had intended, as a prologue to this paper, a short discussion on enlargement, but the subject is too wide for such treatment, and it may suffice to say that—(1) it is often impossible to differentiate between dilatation and hypertrophy, or the amount of each in a given case; (2) data are as yet very incomplete as to the variations in size and position, and of the movements of the heart as a whole within the thorax in different positions of the body—matters which probably vary at varying ages and in different types of individuals; and (3) all the means at our disposal for estimating the size of the heart are open to fallacy. Percussion is perhaps the least reliable, for

differing outlines are often drawn by two or more skilled observers. The results of palpitation seem obvious, yet may be quite unreliable, for, apart from displacement, an impulse (presumably conducted) is sometimes felt well outside the nipple line when a skiagram will show the heart to be well inside it; and yet skiagraphy is often discredited because of its tendency to exaggerate the cardiac area.

In connexion with enlargement I would submit that—(1) it is easy to make mistakes as to size, (2) the condition may be temporary, and (3) many permanently and considerably enlarged hearts may be safely allowed such effort as is comfortably tolerated. I could cite cases illustrating all these points, but space forbids, and one must suffice.

What the evidence was I do not know, but presumably it must have been convincing, as three different R.A.M.C. boards, each confirming the previous decision, threw this officer out of the army in 1919 on account of "cardiac debility with great enlargement," and he was told that he must, for the rest of his days, lead a very quiet life. As he had been used in earlier years to climb mountains and wanted to do so again, he came to me in 1920, because he had been told that I was interested both in mountains and in hearts. I found him in poor condition generally, the result of illness and war conditions, and he had a systolic murmur, but I found no evidence of cardiac enlargement, and a skiagram by Dr. Robert Knox showed a heart of normal size. Clearly the army boards were mistaken, or else the enlargement was temporary. I allowed him to do some mild climbing in 1920, and it improved his condition wonderfully; while in 1921 I let him climb as much as he liked, when he made some fine ascents and came back very fit indeed. In 1922 he was a distinguished member of the Everest expedition, was never sick nor sorry for a day, and now looks ten years younger than he did in 1920.

GENERAL CONSIDERATIONS.

How difficult it often is to decide on the amount of liberty that may be safely allowed to a heart patient is evident, and it is hardly surprising that different practitioners should take different views. But that extreme divergence of opinion should be possible on individual cases—a fact that both we ourselves and the public recognize—does not bring credit to the profession. It should not be; and I offer this paper as a small contribution towards what I trust is a reasonable attitude.

To impose sufficient restriction "to be on the safe side" is the easy solution of each case; yet needlessly to restrict is not only to disobey the Golden Rule, but to depress the patient's health and spirits, to limit his life and his interests, to lower his money-earning capacity, and to bring anxiety to himself and his family. These are considerations which should ever be present in our minds when dealing with these cases, and I think it is good to form the habit of asking oneself before giving a decision, "Can he safely be allowed to do more?"

In approaching any individual case the first point to settle is whether it is or is not a cardiac case at all, or whether it is a mixed case. Dyspnoea on exertion at once suggests the heart; but many other conditions may be causal or contributory, and, though cardiac weakness may be present, it may be secondary. Chlorosis, pernicious anaemia, and the secondary anaemias of malignant and other serious diseases are not only direct causes of dyspnoea, but also of cardiac weakness, from lack of healthy blood supply to the coronaries. Phthisis and emphysema are probably not often overlooked, but a quiet pulmonary effusion may exist without suggestive symptoms; while, in cancer of the lung, dyspnoea is sometimes the earliest symptom and the one which brings the patient to the doctor. And then there is Graves's disease and the "effort syndrome," in which the heart is rapid and feeble, but only as part of a general asthenia—a mixture probably of neurasthenia and endocrine anomaly; and there is Addison's disease itself, and diabetes. In the early stages of many of these disorders breathlessness may be a prominent symptom, and the heart may be suspected, and perhaps there is a murmur. It behoves us to be wary and look all round.

And now let us come to the cases in which the heart itself has been carefully isolated as the seat of such mischief as there may be, and we shall find that each case demands individual consideration, and that the degree of effort restriction requisite varies from *nil* to complete immobilization; though even in the worst cases the hope may

*A paper read at a meeting of the Kent Branch of the British Medical Association at Tonbridge.

generally be given that severe restriction may be only temporary—a rider to the verdict which often brings the greatest comfort to a mind perhaps suffering from the fear of sudden death, or (what is to some natures an even more dreaded development) permanent invalidism.

SINUS ARRHYTHMIA AND MINOR ANOMALIES.

The cases in which no restrictions at all need be imposed, beyond the avoidance of what causes obvious distress, are found in the lesser degrees of all kinds of heart lesions, and in patients of all ages; they include a large proportion of the "nervous hearts," the palpitations due to extrasystoles, and, in my view, many of the minor anginas. But the commonest case in which we can do the greatest service to the patient occurs where the irregularity of childhood and youth, due to sinus arrhythmia, has caused alarm to parent and doctor. Many such patients are prone to faint, the irregularity of heart and pulse may be extreme, and there may be a mitral systolic murmur either while recumbent or erect, or, much more rarely, both; and yet complete liberty may be safely given, governed only by the general after-effects of exertion, equally applicable to patients who have typically normal hearts. The essential thing is to be able to recognize the rhythm, and its recognition is extremely easy. In the first place, it is by far the commonest irregularity of childhood and youth, and the subjects, though they may be prone to syncope, do not faint when they are playing football, but do so on being vaccinated or having a thorn extracted, or on hypodermic medication, or on seeing someone else subjected to some similar procedure, or sometimes from close atmosphere, or from obviously emotional causes. The condition is due to vagal influence, and affects both auricles and ventricles. Exercise sufficient to quicken the heart's action abolishes the irregularity, and is a useful test. Again, the rhythm often bears a direct relationship to respiration, while in periods of regularity the respiratory phases can be readily elicited by telling the patient to lie down and take long breaths, when the pace will be found to get quicker during inspiration and to slow down during expiration, and during the pause that follows if the patient is directed to hold his breath before taking a fresh one. This is a test of great value to apply to all youthful heart patients, whether they show obvious irregularity or not, for sinus arrhythmia, whether spontaneous or induced, is strong presumptive evidence of healthy heart muscle. Unfortunately it is rarely found after 20, and is very rare in later years.

AURICULAR FIBRILLATION AND SERIOUS DISEASE.

Leaving these innocent cases with the reminder that countless children have had their school days spoiled, their health depressed, and their characters emasculated by needlessly imposed restrictions, I propose to jump to the other end of the chain, and consider the cases which, on account of the severity of the symptoms, must obviously, for a time at all events, be confined to bed; and a comprehension of the two extremes will be a guide to all that lies between them. Such cases are the bad anginas; the heart-block cases with a ventricular beat below thirty; some of the tachycardias; some of the fatty hearts; the infective affections of endocardium and valves; and severe phases of the valvular lesions. But the main element in them all is the lowered efficiency—and very generally the definite disease—of the myocardium. Many of them have dropsy of the legs and albuminuria, enlarged liver, and pulmonary oedema, and many have a fast and irregular pulse.

In a recent paper Lewis has laid down the axiom that no practitioner is a fit person to undertake the guidance of heart cases unless he can recognize and differentiate between the various forms of arrhythmia and is conversant with their significance. Fortunately, there is no reason why any practitioner should not learn very quickly and very easily to recognize them, though it must take much study to understand them as fully as is desirable. We have seen already how easy and how important it is to distinguish sinus arrhythmia, and so it is with auricular fibrillation. Practically all the severe cases of heart disease which show a rapid irregular pulse are instances of auricular fibrillation; and, whatever the cause—what-

ever the valve lesion, if any—the importance both as to prognosis and treatment depends on the fact that this rhythm occurs only with a damaged myocardium, which will never again be a sound one, and yet which is, perhaps more than any other serious heart anomaly, susceptible of improvement under treatment.

The bearing of fibrillation on the heart's capacity for effort is all-important. Not only must the condition be recognized, but the effects of treatment must be known; as, in nineteen cases out of twenty, the possibilities as to a more or less normal life will depend absolutely on the proper treatment of the case with drugs. Consequently, a short recapitulation of some essential points as to diagnosis and treatment seems necessary before formulating rules for effort.

The irregularity of fibrillation is generally easily recognized by what is called its "absolute" character, which means that no two consecutive beats are of equal length and volume—a point best demonstrated by instrumental tracings, but generally recognizable by the finger and the stethoscope. Sometimes the pace and the irregularity are so extreme as to amount to what is called delirium cordis. In other cases the rhythm is only moderately disturbed, but in these the irregularity is increased by exertion, and it is the *only* irregularity which is so increased. These points generally suffice to establish the diagnosis, and they mean that the auricle is practically paralysed—for it remains in a state of diastolic dilatation, and becomes a mere reservoir. The rhythm, always sudden in onset, is sometimes temporary, but if so it tends to recur, while far more frequently when once started it is permanent.

Auricular fibrillation can often be stopped and the normal systole restored by quinidine—a remedy derived from cinchona. But the effect is only temporary, and we do not yet know if it can be safely continued indefinitely, while we do know of definite dangers connected with its use. Digitalis, which can very generally be continued indefinitely, is likely to remain the sheet anchor. Though it does not restore the auricular systole, yet, in the vast majority of cases, by diminishing the conductivity of the "bundle," it slows and steadies the ventricles to such a degree that many cases assume what feels to the finger at the wrist an almost normal rhythm; but this result will not be attained unless the drug is given in adequate doses: 3 or 4 drachms of the tincture (3 generally suffices), or an equivalent of some other preparation, should be introduced into the system as quickly as possible. Twenty minims every four hours, but stopped if the pulse came down below 70 or if vomiting occurred, was Mackenzie's classic rule; but in urgent cases a drachm (or even 2 drachms) may be given as an initial dose and repeated at six-hourly intervals till 3 drachms have been administered. Perhaps the best routine is to give an initial drachm and begin the 20-minim doses six hours later. As a rule the pulse comes down to below 80 in two or three days at the outside, and the chief symptoms clear up very quickly. The drug is then discontinued for a few days and recommenced in much smaller doses—perhaps 10 minims once a day or on alternative days. The minimum dose to keep the pulse below 80 should be discovered, and then continued indefinitely. Practitioners are sometimes nervous about giving the large initial doses in cases of high blood pressure, and apprehensive of the "cumulative effect" of long continuation of the smaller doses. But they need not fear in either case; for digitalis does not increase the pressure, and the first effects of overdose (a pulse below 60, "coupled beats," or vomiting) are easily recognized; and if "cumulative effect" does harm, it must clearly be by overdose. Nausea is a warning to attend to liver and digestion, and to stop the drug for a week or more, but watchfully, recommencing if the pulse rises above 80.

We are now in a position to consider the permission of graduated effort in cases of fibrillation, and the rules apply equally to the other severe cases of heart disease where complete rest is obviously necessary at first. If the symptoms fail to improve under appropriate treatment, the outlook is bad; but if they do improve, we may begin to let the patient move about the room; then on the same

landing; then out of doors—walking, or in chair or vehicle, but sleeping on the ground floor, or carried upstairs, though walking down; then walking up a short flight of stairs once a day, then twice, but always walking upstairs first and then down, before walking down and then up—and one begins with not more than half a dozen steps, perhaps at first taken walking backwards. The same rule applies out of doors on gentle inclines and later on steepish hills—always up first and down back, and always turning back as soon as distress begins. The plan, of course, is obvious and is used by every practitioner, but such patients need “rules” more perhaps than any other class of case. They often feel so well (within their limit) that not only are they prone to give up taking their digitalis, with disastrous results, but are apt to think that they can do anything, and that restrictions are needless. And restrictions are *always* needed. They can be led from stage to stage—some further, and some not so far, but in no case can they have full liberty. The doctor's aim should be to lead them as far as is safe in the path of freedom, and then to tell them to keep within this limit, possibly with the hope of further liberty later on.

I have found it convenient to divide the extremes of human effort into seven degrees: (1) Complete rest in bed. (2) Movement on the level. (3) Quiet ordinary life. (4) Mild gardening, gentle golf, and slow hill-climbing, or easy manual labour allowed. (5) Any effort short of extreme exertion. (6) Full liberty of full health. (7) Exceptional effort only possible for athletes in training.

With regard to cardiac cases, the first four come into daily consideration, and occasionally the fifth. But it must not be supposed that one jumps from one stage to the next; progress must always be gradual, and in the early phases of convalescence from heart failure the greatest caution is needed, each step being taken tentatively, with the knowledge that one may have to go backwards and forwards before giving liberty on the next platform. Further, such patients have their good days and their bad days, and must be cautioned when off colour, or on a very hot day, or a very cold day, or after a bad night, or after some unsought strain, either physical or emotional, to go easy for a day or two, and not push on with the idea that it is “giving in” to do less to-day than they did yesterday. Again, women must regard the menstrual periods, and should take life very gently at these times, and generally take a day or two in bed. Many cardiac patients are well advised to breakfast in bed as a rule, and perhaps to have a midday rest; and some require to take a rest day once a week, while all must be cautioned not to undertake exertion immediately after meals, and never to hurry. All must be careful also to feed simply, to take mild aperients if needful, and to avoid, as far as possible, catching colds and the like. Subject, however, to these limitations, and to such as may be indicated by individual susceptibilities, requirements, and inclinations, many cases of marked heart failure—with or without fibrillation—who may have to be kept in bed perhaps for several weeks, may be given the hope that they will eventually be able to live a life of usefulness and of enjoyment.

I have a patient, aged 55, who has had fibrillation for at least ten years, who has a somewhat enlarged heart with definite valvular and myocardial disease, and who has had an attack of paraplegia with aphasia (embolic). Yet he has married in the interval and has two children. He drives his own motor (self-starter), goes out for a quiet day's shooting on fairly level ground, and lives a very satisfying life. It is comforting to know that second attacks of cerebral embolism are extremely rare, and this assurance has been of the greatest benefit to this patient, who at one time suffered much from continual apprehension that another “stroke” was inevitable.

THE HEART'S ENERGY AND RESERVES.

The amount of blood in an average human adult body is about 8 pints and weighs about 10 lb., and the whole of it is driven through the entire circulation, at the normal pulse rate, once in every 40 seconds, in an individual at rest (Haldane). This means that twelve pints of blood (six by each ventricle) are propelled by the heart every minute, or over two thousand gallons, weighing about ten tons, per diem—a truly prodigious display of energy. And yet this is but a minimum, which is increased several fold as mus-

cular work is undertaken; for, given sound muscle wall and healthy coronaries, the reserve capacity of the heart is very large. Of course, as age creeps on there is some loss of elasticity, and the margin is reduced, while in a damaged heart this is further encroached on. Yet such is the reserve that many seriously damaged hearts, even in advanced age, possess margin sufficient for the calls of a quiet life.

Another way of appreciating the amount of work performed by the heart is to compare it with the hand, which can, with a Higginson syringe, only pump a pint and a half of water a minute, and which, even when working a Junker's inhaler at 60 or 70 contractions a minute, tires after two or three minutes, so that one is glad to change hands. Of course, the comparison is not a fair one, for the hand is a marvellous mechanism, and is capable of playing five or six hundred separate notes on the piano in a minute, while, on another score, it is seldom recalled that the “tireless heart” rests for about twelve hours out of the twenty-four. Between each beat it pauses, and whether it beats fast or slow, it rests for about half the time, though at high rates it is diastole which is chiefly encroached on. The value of securing, if possible, a pulse of moderate rate in a weakened heart is obvious, and is further appreciated if one considers the number of systoles that can be saved in a day; for while a normal pulse rate means about a hundred thousand systoles per diem, a pulse of 100 is roughly half as much again. In relation to cardiac muscular exertion this would mean one and a half times as much work; and though the rapid pulse of fever and debilitated illness probably obeys other laws, there can be no doubt that high frequency in a resting patient means waste of cardiac effort. Rapid action reduces reserve capacity, but unfortunately, apart from fibrillation, our means for dealing with this state are singularly meagre, and often ineffectual.

INDIVIDUAL SYMPTOMS AND LESIONS.

Before passing to some brief remarks on individual conditions, I would pause to observe that it is chiefly on general lines that the possibilities of effort limit in individual cases are best judged. Prior to the advent of gross evidence, such as swollen legs, albuminuria, enlarged liver, and obvious cyanosis, heart failure is generally ushered in by breathlessness or pain. In either case, no matter what the lesion, reduced effort as an initial step is essential; and, whatever the lesion, the amount of restriction must depend on the urgency of the symptoms, which, if severe, point to a preliminary period of rest in bed for a few days or for a few weeks, and seldom, in recoverable cases, for longer; while in many instances the initial limitation need not be so extreme. Each case must be judged on its own indications. There are, however, a few special conditions which require a special word.

The two varieties of arrhythmia which give direct guidance on effort limitation having been already discussed, a very few words will suffice for the remainder.

Extra-systoles, easy of recognition, and the commonest cause of irregular pulse in adults, occur in hearts both healthy and diseased, but in an otherwise healthy heart they do not call for restriction of effort. *Heart-block* of marked degree generally imposes its own limits, but the minor phases, if detected, indicate caution. *Paroxysmal tachycardia* is generally disabling during the attacks, which always start and end with absolute suddenness. Between the paroxysms the patient may do what he can manage comfortably, and may be trusted to do nothing which his experience proves to be unwise.

Much the same may be said of the *anginas*, though, in progressive cases, a period of five or six weeks of complete rest in bed often brings a respite, and delays advance. Attacks of true *cardiac asthma* commonly occur at night; and these patients are seldom pulled up by immediate distress, as are the sufferers from angina. But the symptom always means serious myocardial disease, and indicates continuous limitation of effort. For *congenital heart defects* no rules can be laid down; they range from the negligible to the rapidly fatal. But loud murmurs of congenital origin may be heard in hearts which are physiologically quite efficient for ordinary occupations. *Pulsus alternans* is seldom recognized, but is of grave import, and demands the utmost caution.

In acute fevers of all kinds the more completely the patient is kept at rest the better, and the heart should be watched for the intrinsic complications so common in rheumatic fever, but not uncommon in influenza, diphtheria, scarlet fever, and other microbic infections.

In *convalescence* there may be difficulty in deciding whether we

are dealing only with toxæmia, or whether the heart is more seriously affected. If there has been pericarditis or endocarditis, or if the intermissions of minor heart-block are detected, one can hardly be too cautious in the guidance of convalescence; but, with the "poisoned heart," so common after influenza and other acute infections, even though there may be a systolic murmur and perhaps some dilatation, it is a mistake to keep the case in bed after the temperature has been normal for a day or two. In such states the heart recovers its tone much more quickly if the patient is got up and got out pretty soon, and encouraged to take such exercise as brings with it a sense of well-being.

The *valve lesions* give us certain indications, the chief being that while those causing systolic murmurs may be treated on general lines, and the murmur often ignored, the diastolic murmurs always carry a special warning, because the lesions giving rise to them (mitral stenosis and aortic regurgitation) are apt to be progressive, and also because, apart from any previous myocardial change, both lesions interfere with the efficient nutrition of the heart through its coronaries. Such patients may feel very well and equal to anything, but, while they may be allowed to undertake ordinary efforts according to their inclinations, they should be warned against excessive strain, and precluded from occupations involving sudden or severe effort.

In *infective endocarditis*, whether acute or subacute, the patients are generally so ill that the question of allowing effort hardly comes in. But if it should arise, the sufferer may safely be allowed to be in or out of bed—indoors or out of doors—as he prefers. Up to now no cure has been discovered, and as these diseases are invariably fatal the sufferer should be allowed to live the life that brings him most comfort and contentment.

I have left to the last the terrible thing called "blood pressure." I have used the instrument since long before it was a fashionable adjunct to the consulting-room, and occasionally I get useful information from it; though, if one makes a guess at the systolic pressure before taking it, it is easy to be fairly right nine times out of ten. Sometimes one finds the pressure lower than was anticipated; but "blood pressure" means to all patients "high pressure," and it obsesses many doctors, and needlessly alarms many patients. One sees people die of cerebral hæmorrhage with a pressure of 150, while many people with a pressure of 180 to 220, or even more, live for years in excellent health, until "the fear of death" is put into them by some member of our profession, who tells them they have passed the "danger level," and they live ever after with the feeling of the rope around the neck. And "well set-up" people come to us and in reply to the inquiry as to what ails them, simply say "blood pressure." I am looking at a note reading thus: "Mrs. H—, March, 1915, æt. 80—B.P. 220—Sep. 1918, B.P. 180." She took no precautions and few drugs, and she ate and drank what she liked, moved about as she liked, and died in 1921 of bronchitis and patchy pneumonia. I could cite many similar cases, and such people may only feel at their best when their pressure is highest, which is reasonable, as it is then that their coronaries fill best and that pressure is sufficient to force the damaged glomeruli, for the kidneys are seldom unaffected. By all means let early arteriosclerosis be recognized and reasonably treated and dieted; but do not let us put the fear of death into such people, or unduly limit their activities. All tissues retain their elasticity and life longer if they are kept in active use; and my belief is that these cases live longer and in better health if they are allowed to take such exercise as they find agreeable.

CONCLUSION.

In conclusion I turn to one or two more generalities, and the first is that every one of us is sure to make mistakes; for, apart from those which we ought to avoid, there are two sources of error which may be unavoidable. People sometimes die suddenly of heart disease who have never had a symptom, and some such cases have been examined within a few months or weeks of their death by the ordinary methods without any abnormal sign being discovered, or anything to suggest that an examination by electrocardiograph (which might have shown something) was indicated. I have seen many sudden deaths from heart disease, but only two of this kind in which a necropsy was made. In one there was a ruptured aneurysm of the left ventricle, while the other showed degenerated heart wall, especially on the right side.

The second source of error is of happier augury, for we

all occasionally see patients who we think will not survive for many weeks, but who live for years.

I have to-day seen a lady of about 70, who ten years ago was at death's door. During all these years she has had fibrillation, extreme cyanosis, and dyspnoea, and grossly oedematous legs, which often ooze; yet she is marvellously cheerful, and goes up and down stairs on the sly, when she can cheat her guardians. Of course she has been taking digitalis all the time. Had I lost sight of her I should certainly have supposed that she had been dead for many years.

Though mistakes will be made, I believe, however, that it is possible, by a careful all-round survey, to be right in nine cases out of ten; and I think that in framing a prognosis, and with it general rules for effort guidance, the general practitioner who has kept abreast of the times, and who has formed the habit of making short notes, has somewhat of an advantage over the specialist who only sees cases in hospital and in consultation. For we can follow up our cases for ten or twenty years, and watch the slow and often surprising sequence of events—an invaluable experience which is, in the majority of their cases, automatically closed to the specialists, who, I believe, often conclude that the patients of whom they hear nothing are dead. But I am very familiar with the great difficulty of following up cases seen in consultation. The doctor in charge always says he will let one hear how the case goes on, and he means to do so. I fear we are all offenders in this matter.

I began with a warning on an old subject (enlargement) and I end with a warning, which time will prove to be right or wrong, upon a new subject. When the stethoscope had revealed the various heart sounds, and their meaning became gradually elucidated, conclusions based on the integrity of the valves dominated cardiology for many decades and led to views many of which are to-day discredited.

With the advent of the polygraph and the electro-cardiograph, the myocardium has come to its own, and it now dominates. This is, in my view, as it should be; and yet I would venture to predict that some of the anomalies of myocardial activity revealed by the electro-cardiograph, and on which discouraging conclusions are now based, will be proved by time to be either of a temporary nature or else of comparatively minor importance, and well within the great reserves which the heart possesses. As an example of the kind of harm that may be done, let me cite a final case.

A lady, aged 36, suffered from palpitation and irregular pulse, and her doctor, unable to differentiate the rhythm, sent her to a specialist, who examined her very thoroughly. I have seen his very excellent report. The irregularity proved to be of a very unusual kind in a person of her age, being a mixture of sinus arrhythmia and extra-systoles. These, he said, might be safely disregarded, and a skiagram showed a heart of normal size. So far no harm had been done; but the blood pressure was high for her age (155) and the electro-cardiograph showed left-sided preponderance, and from these data he concluded that the myocardium was permanently damaged, and enjoined that "for the rest of her life she must keep this fact in mind and live well inside her limited capacity for effort." She has always lived on these lines, for she has no taste for sport, and has no temptation to undertake excessive toil. But she received a shock, and now suffers from "heart upon the brain." She is becoming neurasthenic, and, finding herself easily tired by efforts which two months ago were not only tolerated but enjoyed, is convinced that her decline of vitality is due to heart disease, that her days are numbered, and that she can never live a normal life again.

The baneful and far-reaching effects of fear should ever be before us, as should be also the tonic effects of hope and reassurance, and the possibilities of improvement which come to all muscles, the heart included, when allowed free activity within the range of pleasurable reaction.

Each case must be looked at all round: no single sign should be given undue weight; but if there is any one point which may be allowed to override the others it is the one to which least attention is often paid—and that is the physiological capacity of the heart, as proved, not so much by set tests, as by careful inquiries and cautious experiment as to the individual patient's capacity for effort in the ordinary calls of life.