muscle heals by the development of a fibrous scar by which the ruptured ends are more or less closely approximated. But even when the ends remain separated by a considerable interval, the functions of the part may be but slightly or not appreciably impaired. This is the case when the muscle involved is one of a group the other muscles of which can take its place. In the instance (*supra*) in which the upper 3 inches of the adductor longus were entirely removed, the patient was unconscious of any muscular defect in the limb.

TREATMENT.

As already said, everyday experience shows—for example, in the case of the tendo Achillis—that when a tendon is ruptured, if the limb is kept in such a position that the origin and insertion of the muscle concerned are approximated so that the ends of the tendon are not widely separated, the result is usually good. But whether operative interference is likely to secure a still better result can be determined only by considering the features of each particular case. Two circumstances may justify or even call for interference: a wide separation of the ruptured ends which cannot be otherwise corrected; and a considerable extravasation of blood, the presence of which would materially prolong the period occupied by repair. Neither of these two features is usually present in the case of a ruptured tendo Achillis; but they are more likely to be met with in rupture of the quadriceps extensor and the ligamentum patellæ. In the former the vasti on either side of the tendon are often also torn, so that a good deal of blood is extravasated and the separation of the ends is considerable.

When the fleshy part of a muscle is torn the attempt to unite the ends by suture would be useless, as the stitches would not hold. If, however, a large blood clot is present, and near the surface, it will be advisable to expose the swelling by a free aseptic incision and remove the clot. At the same time any available portions of the sheath of the muscle should be drawn together and sutured. I am not aware that this has been done in the case of the rectus abdominis, but when the rupture is extensive such a proceeding, as this muscle has a strong sheath, might be a material safeguard against subsequent yielding, and the development of ventral hernia.

AN ADDRESS ON SOME OF THE INDICATIONS AND LIMITATIONS IN CARDIAC THERAPEUTICS.¹

By WILLIAM RUSSELL, M.D., F.R.C.P.E.,

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I AM often impressed with the omissions in clinical records, and doubtless the same thing has impressed you. You know how a successful series of operations, or a successful series of cases of some disease treated by the same drug or by a common method impresses us. We are ready to learn, and we almost gladly adopt a drug or a method which appears to give so much better results than we have had in treating a long series of cases. When we try the new remedy we find that matters may not be much better than with the old; that if there are some points better, others are not so well, and so on. This seems to me to be very much due to the one-sided records we get. A surgeon gives us a series of successful abdominal or cranial operations, and we think what a harmless operation this or that is. But how many of us know that there is another side to this—that we do not hear much, if indeed anything, of the unsuccessful cases in other men's hands, the knowledge of which would very materially influence our position, and very largely determine the advice we might give a patient, advice which might be life or death to him. In medical cases we can only estimate fully the value of remedies when we know of the unsuccessful as well as the successful cases. A record of success only leaves the impression that success always follows proper administration, and that failure implies want of skill in the use of the remedy we are handling. This is rather implied or suggested than

¹ Read before the Hull Medical Society.

asserted, but it stirs in some minds the consciousness that their record has not been an unbroken chain of successes, and that therefore they must have failed where others would have succeeded. We know it is not necessarily so. In many matters this general position could find illustration, but meanwhile I am to confine myself to some practical questions concerning the treatment of heart conditions.

When I left Edinburgh with my degree, and full of ardour, belief, and faith, both in the then present, and in the future of scientific therapeutics, I was full of the value of digitalis in heart lesions. I had absorbed with avidity what was considered the most forward teaching of the time, and I followed it to its logical consequences. If a heart's compensation had failed from enfeebling of its contracting power, digitalis gave strength, and if the compensation were not being re-established, the patient was not getting enough digitalis.

In recent days, strophanthus, the new heart tonic for which we are indebted to Professor Fraser, has sometimes been advocated with an ardour that recalls my student days, as if history were repeating itself after twenty years. The impression I get must be much the same as that of my fellows—we fly to the new remedy with the hope that it is to do more wonderful things than the old drug, and for a time no case of heart disease is treated aright unless the new drug is being given. This may have its good side, but practically we soon discover that our new instrument fails, as the old one did. What I should wish is that we had definite indications given to us as to the limits within which we have a right to expect good results, and equally precise indications as to the cases and circumstances in which we need not look for success, or may look for a very fleeting success at best. As a profession we know the value of tonics which are mainly cardiac. We also know that in many cardiac cases treatment by tonics does not succeed, and yet how many of us could give any clear statement of why failure has resulted? Do we know (as we might, I think, know) when we need not expect much from their administration? Do we know when full doses and when small doses ought to be given, and when indeed a given drug is to be used or not? The largeness of the sphere of influence of cardiac tonics is known to everyone, but we are still in search of the limits of that sphere on every hand. This delimitation can only be satisfactorily attained by recounting our failures, and recognising the factors in individual cases which have determined failure; and also by seeking to give intelligent expression to the considerations which lead us to give digitalis in one case, strophanthus in another, and neither in a third. Of course, it is in the choice of remedy and the mode of administration that skill is shown, and it is in some an educated instinct. The indications which determine the choice are nevertheless capable of being defined, however difficult the analysis may be.

If I attempt in what I have to say to lay down some of the indications and limitations in the treatment of cardiac disease from the gleanings of my own experience, it is from no sense of over-confidence in these that I do so, but rather as an indication of the direction in which I think the profession requires and seeks more definite knowledge.

In the first place there are the cardiac cases which require no special cardiac treatment. Many cases of cardiac lesion, as we all know, are discovered accidentally, and when there are no symptoms referable to the cardiac lesion they are to be left alone. It is usually desirable, however, to tell your patient that his heart is not quite sound, and in some cases it may be necessary to warn against violent or sudden physical exertion. The question of necessity will depend upon the estimate formed of the effect the lesion has had upon the heart chambers, this being the indication of the probable future course of the case. The routine administration of cardiac tonics is a quite inadmissible position. I have frequently discovered cardiac lesions when the symptoms complained of were in the abdomen. Quite recently I had a case of this kind at the Infirmary. The symptoms in that case were definitely referred to the stomach, but the man had aortic valve lesion and aortic aneurysm, of which he was quite ignorant, and which assuredly had no connection with the gastric symptoms. The gastric condition was a trouble and a discomfort, the condition of the heart and aorta was not. The call for therapeutic assistance was from the stomach.

The action to be based upon the discovery of the cardiac and aortic lesion was a question of ethics, and, to a working man, of what was practicable. I hold that a man ought at least to have the option of running the risk of dying at his post and in harness, to dragging out a little longer period of life, wearisome from compulsory inactivity.

A much more frequent class of case is that in which the heart is complained of when there is no heart lesion, the supposed heart trouble being the result of gastric, hepatic, or intestinal disorder. About these nothing need be said further than that their successful treatment depends upon the correctness of the diagnosis.

Another class is by no means uncommon, that in which there is complaint, and, perhaps, knowledge, of heart lesion, but in which the symptoms complained of may not be due to the cardiac lesion at all, but to the disorder of abdominal viscera, which may or may not be causing reflex heart disturbance. An elderly lady who consulted me a year ago well illustrates this class. She knew she had heart trouble, and showed me several prescriptions admirably suited for certain heart conditions. Her main complaint was "weak heart and breathlessness." She had a small and an irregular pulse. The heart apex was in its normal position, and there was no murmur. The first sound had the character it often presents when there is some mitral stenosis, and the second sound was accentuated and occasionally reduplicated. The real trouble in this case was in the digestive tract, and was kept up by what might safely enough be called a gouty bulimia. Treatment suitable to her digestive derangement soon restored her to a greater measure of comfort than she had experienced for years, and she remains to-day practically unconscious of her heart's existence. Another case is that of a gentleman who has been under my direction for years. When he came to me first he had both a flagging heart and gastro-hepatic disorder. He was a very active business man, and put considerable strain on both circulation and digestion. He had aortic stenosis and a dilated aorta. Heart tonics, and a rigid regulation of food and stimulants, and curtailing his physical activities greatly improved the strength of his heart muscle in the course of some months. He comes to report himself frequently, and when he seeks advice it is nearly always for heart discomfort due to injudicious feeding. This patient has been most exemplary in conscientiously endeavouring to carry out instructions, and he has the reward of having been able to attend to his business regularly and efficiently, although less vigorously, and that in spite of a degree of aneurysmal dilatation of his aorta which carries with it considerable risks.

It is unnecessary to multiply examples of this class of case; they are common. The point is, that the existence of heart lesion is very apt to obscure the diagnosis or to mislead entirely, and this is the more unfortunate because the essentially cardiac tonics are really not called for, and may even do harm to both heart and digestive system. Judging from my own experience I should say that the important influence gastric disturbance exercises upon organically diseased hearts is not generally and fully recognised; or the gastric disorder is wholly overlooked, and the gravity of the symptoms attributed primarily to the cardiac lesion and treated accordingly.

Turning to cases with marked valvular lesion, let us consider in the first place those of aortic origin. Of the valvular lesions, aortic stenosis, more commonly than any other, does not call for therapeutic interference. It is quite extraordinary the degree of stenosis or obstruction which may be present without cardiac insufficiency, and without appreciably affecting the life of the individual, until some relatively slight additional element disturbs an equilibrium which has lasted for many years. The last case of this kind which I had known for some years, and in which I had a *post-mortem* examination, was a man over 80 years of age, whose aortic orifice was a narrow slit with rigid valves, and who, until a few days before death, went about with wonderful vigour for his years, and was apparently in no way impeded by his aortic lesion. His heart gave way under a gastric catarrh with dilatation, a condition often precipitating cardiac failure in old people even without material endocardial changes. This is but one of various conditions in which the addition of an incidental and comparatively slight element fatally

disturbs the cardiac balance—a patch of pleurisy, a little bit of pneumonia, even without a rise of temperature, may do it.

When aortic stenosis is accompanied by incompetence, the conditions are as a rule different, but even in these much depends upon the degree of incompetence. A lady I saw some years ago assured me she had known of the existence of her double aortic lesion for over twenty years, and when I saw her the heart condition called for no direct therapeutic measures. Cases of this kind are, however, comparatively rare, the majority of them requiring treatment, and it is here that a difference of opinion almost certainly exists, and where individual experience and procedure vary. To maintain that digitalis is suitable and applicable in all cases of double aortic lesion, or of regurgitation alone, with of course failure of compensation, is not borne out by my experience. But it is equally contrary to my experience to hold that it is never applicable. In pure stenosis with a faltering ventricle it is always applicable, but in regurgitation we have to try to define the conditions in which we may expect it to act beneficially, and when otherwise. The first element is the pulse-rate. If it be from 60 to 70 digitalis is not suitable. The action of digitalis in average medicinal doses is to prolong diastole while strengthening systole, and the administration of the drug so as to produce this result, even in a slight degree, is attended with danger, for even a moderate prolongation of diastole may give time for an amount of blood to regurgitate into the ventricle which leads to increased embarrassment, or even a fatal degree of over-distension. On the other hand, aortic incompetence with a pulse which can be slowed to about 70 is benefited by digitalis. There are cases in which the pulse is not thus influenced by digitalis, and in these there is often, if not always, other evidence of acute changes proceeding in the endocardium, and whenever there is an active endocarditis present digitalis is rather hurtful than beneficial in my experience. With the pulse between 60 and 70 I have notes of cases very markedly benefited by belladonna. In these the pulse-rate rose some 10 beats per minute, and this was associated with marked relief of dyspnoea and cardiac distress. In these cases I gave $\frac{1}{4}$ of the tincture three times a day, and stopped it as soon as the pupil gave the slightest indication of being influenced. Following on the relief, arsenic, iron, or other tonics may be given, with occasional resort to belladonna either in the previous or smaller doses. Great care has to be exercised with the larger doses, for as soon as the physiological effect is indicated by the pupil the pulse tends to lose its tone and volume. The explanation of the effect is to be found partly in the fact that belladonna accelerates the cardiac action, but also, I believe, in the further fact that it relaxes arterial spasm. This point of arterial spasm is of great importance in aortic cases. It is readily recognised in the radial artery by the firmness of its wall, and this is quite appreciable notwithstanding the collapsing character of the blood wave. When this is present it has to be remembered that the coronary arteries must participate in the spasm, and that thereby the nutrition of the myocardium is lowered in proportion to the degree of anæmia. The anæmia is the result of the arterial spasm. The relaxation of the arterial wall which takes place under treatment can be plainly enough appreciated in the radial artery by the educated finger. In connection with this question of spasm let me say that I always regard its existence as a contra-indication to the use of digitalis, for I have never found it then other than useless or hurtful. It has been asserted that strophanthus does not act on the muscle wall of the arteries, and I have allowed it to be given in such cases as I have been discussing until the increasing tension of the radial wall and increasing dyspnoea have led me to order it to be stopped, with the result that marked relief was given to both. Before leaving the consideration of aortic lesion I may add that I have tested the effect of iodide of potassium, which sometimes leads to considerable amelioration of distress, but the explanation is to be found in the relief of vascular spasm, and not to any direct action on the heart. It requires to be closely watched, for I believe I have seen it produce a fatal result by being pushed too energetically after relief had been obtained, the relief being followed by a dangerous fall in blood pressure. It cannot be too anxiously kept in mind that the relief of spasm is all that is wanted, and if the remedy used for this purpose

is continued it is certain to end in disaster. This is as true of the nitrites as of belladonna and iodide of potassium.

It may be well to state in connection with aortic incompetence that small doses of the tincture of digitalis, say from 3 to 5 minims, are not necessarily hurtful, but even these are so if they lead to slowing of the heart-rate; and I am not satisfied that doses which do not affect the rate have any better effect than the same quantity of iron, strychnine, or arsenic. The association of mitral incompetence with aortic lesion does not modify the general propositions I have ventured to express.

In mitral lesion the conditions bear a considerable resemblance to those in aortic disease. In regurgitation digitalis acts admirably when the heart-rate is rapid, but it is by no means so satisfactory when the rate is slow. In these latter iron and strychnine are often more useful. The rate to which the heart may be slowed with advantage is limited, and when this has reached a certain point it is often a question whether or not the digitalis ought to be continued. I have noted one important indication that the drug is being pushed too far, namely, when the pulse has been slowed from about 80 say, to 60 or lower, and the pulse has acquired a character which I call languid. I know no word which better defines this character; it has a drawn-out upstroke without a correspondingly drawn-out downstroke. It is not a pulse of high tension, for the wave, after it reaches its summit, is not maintained, and there is no abnormal fulness of the vessel after the fall begins.

This languid character may be present in a pulse beating 60 or more, and that it is caused by the drug administered is proved by its disappearance when the drug is stopped, and it may be reproduced by again administering it. The effect in individual cases does not necessarily depend on the amount given, for in some cases it is produced by 5-minim doses of the tincture of digitalis given thrice in twenty-four hours, or by correspondingly small doses of strophanthus. This character is a most valuable indication as intimating that digitalis or strophanthus has been carried beyond the limits of their utility.

Another important element is pulse tension. And by tension in this case is not to be understood the full artery with a large and sustained wave, but the small and feeble wave on the top, as it were, of the full vessel. When this condition is present digitalis is, for the time at least, contra-indicated. These finer modifications in the pulse require much careful attention, and without a due recognition of them we can hardly be skilful in cardiac treatment. Also it is not merely as pulse that the radial artery has to be regarded, but rather with the mind directed to the heart, and picturing each and every pulse wave as the result of a ventricular systole, whose languid, impetuous, or feeble contraction is almost as real to the mind's eye as if the parietes were removed, and we were directly watching the cardiac movements themselves. This can only be attained by some expenditure of time and patience, and is not consistent with a hurried visit and a rapid examination. Time has to be given for temporary excitement to subside, for the pulse at its worst is the index of the heart's power and acting.

In the first breakdown of compensation in mitral regurgitation, and in some cases after several breakdowns, there is little difficulty in re-establishing compensation if the action of digitalis or strophanthus be watched closely, and care be taken not to continue it beyond the point I have indicated above. As the ventricles become more and more dilated and the muscle more flabby with each breakdown, the addition of iron or strychnine or both is often of great value. One of the practical difficulties in cases where there have been several breakdowns is the question of prognosis—that is, the question as to the issue of the particular failure. This is a point of great difficulty if you see a case only once as a consultant. If a case has been treated with digitalis or strophanthus, and perhaps iron, arsenic, and strychnine, for a considerable period, and if in spite of this symptoms are either not improving or there is a slow but steadily advancing anasarca, the prognosis is exceedingly bad, and no new combination of drugs is at all likely to be of much advantage. Seeing a case of this kind as a consultant, there are no very outstanding features which necessarily lead to the conclusion that the failure you have to deal with is the final one, unless

due and full weight be given to the fact that the patient has not responded to the treatment adopted.

This point of failure to respond to remedies is an element which, both with patients under our immediate care or seen in consultation, must have due weight given to it if an erroneous opinion is to be avoided. I have at present a woman under my care in Queensberry House Hospital with a dilated and feeble heart due to mitral incompetence, whom, were I seeing her incidentally, I might be disposed to regard as by no means hopeless, and yet, in spite of my best efforts, she has become steadily more anasarcaous. Her pulse is about 80, but a mere thread, and neither digitalis nor strophanthus has had any effect in checking her downward course, or has made any impression upon her heart and pulse. A case I saw a few months ago seemed to me by no means hopeless, but my prognosis was guarded, avowedly because of treatment having failed; and that patient died in a week or so after I had seen her.

Recently I had temporarily under my care a patient who, when first admitted to hospital, had, under cardiac tonics, his compensation rapidly re-established, with disappearance of anasarca, but who, from some slight cause, suddenly relapsed, and treatment entirely failed to re-establish him. In some cases of this type a satisfactory result is determined by removing fluid from the pleura or the oedematous limbs, but unless at the same time an impression can be made on the circulation by means of drugs, the expedient is only palliative, and its benefits very evanescent.

In mitral stenosis the relation of heart-rate to treatment is the reverse of what it is in mitral or aortic regurgitation, but comparable to that in aortic stenosis. In mitral stenosis, the greater the stenosis and the smaller the orifice the slower must be the heart-rate to enable the circulation to be carried on with any degree of efficiency. A prolonged diastole is the condition to be aimed at in order to allow the ventricle to receive as much blood as possible from its auricle. When compensation has failed, the heart-rate is usually greatly accelerated; and here it is necessary to bear in mind that the heart-beats have to be observed, for many of them are too feeble to produce any perceptible wave in the radial pulse. In fact, unlike all other cardiac lesions, the heart is more the guide than the pulse, although as matters improve the pulse reasserts its clinical importance. The rapidity of the heart-rate is readily ascertained by placing the hand on the precordia, when the rate as compared with the pulse may be as 2 or 3 to 1. When this rapidity of cardiac action is present, good results may be anticipated from digitalis or strophanthus. In a case recently in hospital, a patient on strophanthus was threatened with a breakdown in compensation, which was rapidly and completely arrested by corresponding doses of digitalis. When anasarca is present, the absorption of any remedy is so impeded that results are necessarily unsatisfactory, and this can be obviated sometimes by hypodermic administration. When anasarca is present, the right heart is so waterlogged with blood that death from asystole is ever imminent, and it is in these cases that bleeding is so useful. Last spring I had a case of this kind in hospital, and the question was whether I should relieve the ventricles by bleeding or attempt to produce a stronger systole and a slower rate by hypodermic medication, and I decided on the latter. It was quite useless to give remedies by the mouth, for nothing was absorbed, and the patient was dying. Five minims of strophanthus tincture with $\frac{1}{10}$ grain of strychnine were given every four hours for two days, and then she was able to take the remedy by the mouth; but eight more days of life were all we gave this patient, for a time comes when the degenerated and exhausted heart-muscle will no longer respond to remedies of any kind. Here, as in other valvular lesions, the question is as I have already put it: When are we face to face with the final failure?

I have not touched the question of the changes which occur in heart muscle and heart chambers which make the difference between compensation and failure, and which ultimately make re-establishment of compensation impossible, for these are pathological and not clinical questions; but one point ought to be remembered in connection with aortic cases, and that is that in addition to the physics of the question there is the further fact that there is often a progressing atheroma or

aortitis of the first part of the artery which may more and more be narrowing the mouths of the nutrient arteries of the heart muscle.

In dilated and flabby and probably fatty hearts, with soft, flabby, and often irregular or intermitting pulse, digitalis does admirably if the pulse is moderately fast, and even when it is slow digitalis in small doses and combined with other tonics as iron and strychnine, and continued for a long period, is often of great value. I have had admirable results in cases of that kind with a pill I learnt many years ago, probably known to some of you. It contains gr. $\frac{1}{2}$ of powdered digitalis, sulphate of iron, and sulphate of quinine, with gr. $\frac{1}{4}$ of black pepper, and grs. 3 of extract of taraxacum; this given night and morning for a fortnight, and resumed after a week's intermission, acts admirably if you give it in time, and continue it steadily in the way I have indicated. Cases of this type are met with in persons well up in life, but are not confined to them; in one sense it might be regarded as the normal "senile heart," for that happy phrase seems only to embrace one type of heart, and leaves out the heart which at every beat threatens to break the degenerated arteries, and which is equally, if not more common in senility than the weak and flabby heart, every beat of which almost threatens to be its last.

I shall not dwell upon the value of digitalis in many cases of acute febrile disease, specially in pneumonia; nor of its value in acute alcoholism with flabby heart and pulse; nor shall I touch the treatment of cardiac dyspnoea of anginous type.

I have not attempted, nor has it been my aim, to go into the wide question of other methods of treatment. I am content if I have succeeded in submitting for your consideration points, bearing upon our ordinary measures, which may tend to formulate somewhat of our knowledge on the indications for the use of these, and some of the conditions which limit their utility, and may even make their administration hurtful.

AN ADDRESS

ON THE

DIAGNOSIS OF FUNCTIONAL FROM ORGANIC DISEASE OF THE NERVOUS SYSTEM.¹

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THE TERMS "FUNCTIONAL" AND "ORGANIC."

THE subject that I have the honour to bring before you is one of the most interesting as well as one of the most difficult problems in medicine. At the very outset one is beset with the difficulty of giving any definition or limitation to the words "functional" and "organic." These as commonly used are pathological terms, but can we say that there are any salient anatomical features which are present in the one and absent in the other condition? Is organic disease of the nervous system characterised by the presence of some definite structural change and functional disease by the absence of such structural change? The general understanding with regard to the latter is that it is a disease in which the nervous system is free from any visible change. But visibility is a relative term; it depends on our eyesight, on the power of our microscopes, and to some extent on the use of staining reagents, and also—let it not be forgotten—on the thoroughness of our search.

Cases of hemiplegia, of bulbar paralysis, and many other nervous diseases in which structural changes are usually found are sometimes met with, quite apart from hysteria, where no visible alteration can be discovered in the nervous system even after a most exhaustive examination. Are such cases to be classed as examples of functional disease? Visibility in the usual meaning of the word cannot then be regarded as a distinctive sign between the two classes. Moreover, we must not forget that even where there is a gross lesion in the nervous system, such as a tumour or meningitis, the manifest symptoms are the expression of minute, probably chemical changes in nerve tissue. For example, the

convulsions produced by a worm in the intestines or by cerebral meningitis are frequently identical, and both depend on irritation of cortical cells; in the former case the irritation is of reflex origin, in the latter it is direct. The change in the cells, or in their nuclei which gives rise to the convulsions, may be the same in both cases.

These examples suggest that duration may be a test sign between functional and organic disease, but here again our search for a boundary line is thwarted, for the question naturally arises, may not definite visible structural changes begin in the brain, cord, or nerves, and, after varying degrees of development, be arrested in their progress, and ultimately completely removed? Multiple peripheral neuritis started by alcohol, lead, or other poison is a noteworthy instance. The evidence of neuritis may be profound, as shown by marked atrophic paralysis of groups of muscles and by considerable anæsthesia; the paralysis, indeed, may be almost universal and yet the patient may in time completely recover. And it is reasonable to believe that the nerves and their sheaths will at last attain a normal condition.

Furthermore, there is satisfactory evidence that gross lesions in the central nervous system become arrested in their growth and ultimately dispersed, and the patient thought to be the subject of incurable disease has made a good recovery. This statement is adequately illustrated by a reference to tumours of the brain and to locomotor ataxy. Many of us have seen cases which ended in recovery, where the presence of headache, optic neuritis, and paralytic symptoms had convinced us that a cerebral tumour was present. I can recall one such case in which the skull was trephined but no tumour found, and yet the patient gradually lost her paralytic symptoms and her headache, and from a condition of nearly absolute blindness was restored to fair though not perfect vision. Moreover, it is a common experience in making necropsies on children's brains to find caseous masses which shell out of the convolutions, and which during life must have been practically harmless. As to locomotor ataxy, cases might be mentioned where absence of knee-jerks, the presence of pains and other signs of sensory disturbance in association with slight inco-ordination and sluggish pupils have entirely passed away. One has seen, too, more advanced cases in which the most extreme ataxia of the lower limbs has been replaced by inco-ordination of much less intensity.

To my mind, the terms "functional" and "organic" as at present employed are singularly unsatisfactory. Even in a passing emotion, such as terror or anger, some change must occur in the brain—we know not whether it is merely a disturbance in the supply of blood to certain parts or whether it is a chemical change affecting for the time being the atoms and molecules of which nerve tissue is composed. Some such changes must take place at the onset of every "organic" disease and the gradations between the changes which constitute the basis of a so-called "functional" disease and those which form the anatomical substratum of so-called "organic" lesions must be infinite and the transition from one to the other imperceptible. With improvements in our methods of examining nerve tissue, the class of "functional disorders" will get smaller and smaller, and in the present state of our knowledge it would conduce to clearness if nervous diseases were simply divided into two great groups, namely: Group I, nervous disorders with known anatomical basis; Group II, nervous disorders without known anatomical basis. In my further remarks, however, I must use for the sake of convenience the terms "functional" and "organic" in their usually understood sense.

Let us now turn to the clinical side of the question and endeavour to illustrate the methods that should guide us in making a diagnosis between functional and organic disease of the nervous system.

It is a commonplace observation, and yet one ever to be borne in mind, that the first thing to do, after listening to an account of the ailment as given by the patient or his friends, is to make a thorough examination of the patient by every means at our disposal, and then having considered the history and the symptoms of the case, to try to determine, first, what part of the nervous system is affected; and, secondly, what is the nature of the affection. Is there merely a change similar to that produced by a violent emotion, and therefore

¹ Read at a meeting of the Wigan Medical Society.