Clinical Heart Disease

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By

SAMUEL A. LEVINE, M.D., F.A.C.P.

Clinical Professor of Medicine, Harvard Medical School
Physician, the Peter Bent Brigham Hospital, Boston
Consultant Cardiologist, Newton-Wellesley Hospital
Physician, New England Baptist Hospital

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Preface to the Fifth Edition

The main advance that has taken place in the past six years, since the last edition of this book appeared, is in surgery of the heart. Rheumatic mitral stenosis is now amenable to surgery and involves a rapidly decreasing operative risk. Surgical correction of other acquired valvular lesions is being attempted with varying degrees of success. It is no longer sufficient simply to diagnose mitral or aortic disease or mitral stenosis or insufficiency. We are now challenged to estimate the degree of stenosis or incompetency of a particular valve, a task that has become very important and at times rather difficult.

Surgery for various forms of congenital heart disease continues to expand. New methods of anesthesia, new operative techniques, and new diagnostic procedures have broadened the field of congenital heart disease that is amenable to surgical correction. Because of the growing importance of this aspect of heart disease, the chapter on congenital heart disease has been completely revised. For this I am greatly indebted to Dr. Alexander Nadas, Cardiologist of the Children's Hospital, Boston, and Assistant Clinical Professor of Pediatrics, Harvard Medical School. He has been in charge of the Cardiac Clinic there and has been carrying on the medical studies in collaboration with Dr. Robert E. Gross in surgical cases in that hospital.

Some advance has been made in the field of electrocardiography, and also vectorcardiography is being further explored. Newer information in these fields is incorporated in the chapter "Clinical Electrocardiography," written by Dr. Harold D. Levine, who is now in charge of that work at the Peter Bent Brigham Hospital, Boston.

A striking illustration of the fruitful advances that may come from the correlation of laboratory and clinical studies is the development of modern surgery of the heart. After the early but unsatisfactory attempts of Cutler and Levine in operations for mitral stenosis in 1923, there was a lapse of about twenty-five years before D. E. Harken and C. P. Bailey, working independently, attacked the problem again, with what has since proved to be phenomenal success. Even before this R. E. Gross had pioneered in this new era of cardiac surgery by achieving the first surgical cure of patent ductus arteriosus in 1938. Since then progress has been rapid. Crafoord of Stockholm, Brock of London, Blalock and Taussig of Baltimore, and Potts of Chicago all have contributed

brilliantly to this new development. In all this work the clinicians must not lose sight of the role played by the physiologist and by other workers in the laboratory. Suffice it to recall the indispensable aid given by catheterization of the heart and the various instruments employed in this work.

I shall ever remain grateful to Dr. C. Sidney Burwell, Dr. Lewis Dexter, and Dr. Walter Goodale, for the help they have given me in the field of cardiac dynamics and cardiopulmonary relationships, derived, as often happens amongst medical colleagues, from numerous interesting conversations and discussions.

Some additions and elaborations in this edition are the result of aid obtained from Dr. Gerald Whipple, in the preparation of the vectorcardiograms, and from Dr. Paul Zoll, in the management of heart block.

I am also greatly indebted to Dr. Bernard Lown for reviewing the manuscript and for his comments concerning its contents, and to Dr. Egon Riss for his painstaking work in constructing an adequate index. Finally, I want to thank the publishers, W. B. Saunders Company, for their sustained interest and cooperation in the printing of several editions of this book.

The preface to the First Edition has been reprinted unchanged, partly for historical reasons, but mainly because it contains some general philosophical notes that have not lost any validity that they may have had twenty years ago.

SAMUEL A. LEVINE

Boston, Massachusetts
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Preface to the First Edition

The purpose of this book is to present in a simple form the important aspects of the diagnosis, prognosis and treatment of heart disease. It is meant to appeal to the general practitioner, and in so far as the information or the points of view that it contains are applicable at the bedside and available to any intelligent physician, just so far will it be useful. No attempt has been made to cover in detail the entire field of cardiovascular disease. Larger textbooks have appeared recently that have done this adequately. Nor does it contain any bibliographic references. For the most part opinions have been adopted that are shared by present-day authorities on the subject. When apparently unorthodox views are presented, I alone must bear the blame for error, if time proves these views to be incorrect. Where questions of opinion or speculations are involved, I have tried to draw the distinction between fact and surmise. This should not detract but rather add to the interest of a medical treatise, for unproved impressions often precede by years established dogma.

It cannot be said that the arrangement of the chapters follows any usual plan. Each chapter may be regarded as distinct in itself and as a brief treatise on that subject. The advantage of this is that they can be read independently. In fact, many of the chapters represent the essence of individual papers that I have published in the past twenty years with the help of various men working at the Peter Bent Brigham Hospital and reflect, therefore, the results of personal intensive study of the problems involved.

After the introductory chapter the various important types of heart disease are considered. When specific or peculiar modes of treatment arise, they are taken up as they come along, reserving the general subject of the treatment of congestive heart failure for the end. Special topics that concern the practitioner, which merit emphasis, are discussed separately. For example, because systolic murmurs are present in many forms of functional and organic heart disease and in fact even in normal individuals, a special chapter is devoted to their clinical significance. Similarly, acute cardiovascular emergencies arise under a variety of circumstances with and without organic heart disease and so, rather than discuss them in each chapter dealing with the respective type of heart disease, a special one is given over to this topic. In this way the reader

can review all the types of cardiovascular emergencies for which a physician may be hurriedly called. Although the chapter on Clinical Electrocardiography was inserted at the very end, it may prove more useful to many to read it first.

Some repetition has seemed necessary and advisable in order to spare the reader from referring too frequently to one part of the book while reading another. In discussing rheumatic heart disease, auricular fibrillation, for example, has to be considered. It also is taken up as a complication of acute coronary thrombosis, hyperthyroidism and other conditions. Nevertheless, when it is reviewed in the chapter on Clinical Electrocardiography, a brief summary is made of all the conditions in which auricular fibrillation is likely to occur. Apart from avoiding this necessity of constant reference to different chapters, such a method has an added advantage. It helps to give the reader two different modes of approach in medical diagnosis. One may start from a given known finding, like a certain irregularity of the heart or clubbing of the fingers, and review what the various causes may be, or begin with a known disease such as coronary thrombosis and predict what kind of complications may arise. Such repetitions, therefore, can only serve a useful purpose.

The hope is that this volume will prove practical. By this is meant that it will be easily understood and useful. It may seem that certain parts receive more than their proper share of space and emphasis. In general, points have been emphasized if they were simple, applicable at the bedside and of direct value to the patient. Little time needs to be spent in a discussion of those subjects or phases of medicine that are already well understood. A consultant with any extensive experience quickly finds out what is known and what is overlooked by the general practitioner. From this experience he can readily sense the type of emphasis that is needed in teaching.

If I may be permitted to digress a bit, I should like to express some views about our current methods of pedagogy in American Medical Schools. Inasmuch as the main purpose of our schools is to train men to go out into the active practice of medicine, we should keep constantly in mind that type of teaching that is practical and useful. The minority of our students, who are to become teachers and investigators, must and do receive postgraduate training in their respective fields. The initial undergraduate course, however, should be the same for all. This curriculum seems to lack a proper distribution of time with insufficient attention to that type of teaching that is most useful. For example, many hours are given to discussions concerning a subject like cancer of the pancreas which is entirely irremediable and too little to tumors of the spinal cord which are often completely curable. The former of course is more common, but the latter is more important because it is amenable to effective treatment. Granted that a medical student cannot be taught all we know about medicine in four or six years, it is more important, when he goes out into practice, that he should not overlook

a case of spinal cord tumor with paralysis that has been diagnosed amyotrophic lateral sclerosis or multiple sclerosis than to recognize a malignant growth of the tail of the pancreas. Likewise, it is much more important that a physician should be able to recognize the thyrocardiacs who are masked as heart patients and suffer invalidism that can be so readily prevented, than to be able to make an early diagnosis of subacute bacterial endocarditis. Until more is known about chronic arthritis and chronic nephritis it might be well to spend less time in our teaching of these subjects and more time with a rare condition like hyperparathyroidism, because the limb pains, renal insufficiency and other disabilities due to the latter can be readily eradicated or prevented by appropriate treatment. In a word, the first purpose in teaching is that the practicing physician should acquire that information which is directly helpful in the care of the patient. This does not mean that clinical investigations and laboratory research concerning the unsolved problems should be discontinued. A certain part of our profession must be constantly engaged in such effort.

Another aspect of medical education pertains to the simplification of medical diagnosis. In teaching hospitals and medical centers elaborate laboratory facilities are readily available for diagnostic purposes. After an extensive *constructive differential diagnosis* has been built up, one possibility after another is eliminated by various tests. When that same house officer or student goes out into practice, he recalls the numerous possibilities involved in a given set of circumstances, but he no longer has the x-ray to rule out tuberculosis, a Wassermann test to eliminate syphilis and a blood culture to dismiss the diagnosis of septicemia. What simple clinical bedside methods remain to enable him to establish a temporary working diagnosis? In other words, how is he to disentangle the complicated differential diagnosis without putting the patient to great expense? This type of clinical teaching has been neglected, for there are simple methods that can be used in what might be called the *destructive differential diagnosis*, which the older or more experienced physicians have learned and which they are really practicing, consciously or unconsciously. A physician finds that a patient has a palpable spleen and fever. Among the various conditions to be considered is subacute bacterial endocarditis. He learned in his hospital training that a positive blood culture would establish the diagnosis, but that a negative one does not eliminate it. He has not been taught, however, that if there are no murmurs whatever, he can with assurance dismiss the diagnosis of subacute bacterial endocarditis. This finding he can obtain in one minute and with no expense to the patient. This merely illustrates one example, of which there are many, where simple methods enable one to rule out possible diagnoses. It would be desirable if our medical teachers paid more attention to this type of instruction.

A further difficulty in our teaching concerns the completeness or thoroughness of the examination. There are numberless tests and signs for various diseases. The practitioner cannot perform them all every

time he sees a new patient. There is not enough time nor can the public afford the necessary expense. Therefore, we must not only teach these various procedures, but we should emphasize more than we do in our schools when these procedures should be carried out. For example, a systolic thrill in the aortic area is an extremely important sign of aortic stenosis, and yet this sign is often overlooked. It can be missed when it is slight, because then it has to be detected by a special technic, i.e., placing the palm over the upper sternum with the patient upright and holding a deep expiration. Physicians cannot and need not go through this procedure with all patients, but should be urged to do so only if there is also a fairly loud basal systolic murmur. Similarly determining the visual fields is a specialized examination and will not be performed by most practitioners. However, it can be emphasized that, if there is some reason to suspect a pituitary tumor, a simple test for bitemporal hemianopsia can be performed in one minute by any physician. Moving a pencil on each side of the patient while he is looking forward and ascertaining when he begins to notice its movements will serve as a gross test of bitemporal hemianopsia. A further example is coarctation of the aorta. We must not only teach what the condition is, but under what circumstances it should be particularly sought. If a routine x-ray examination were made of the chest in all adult cases it would not be overlooked. This is impracticable. We can emphasize that it needs to be thought of in all those who have hypertension, particularly in younger individuals, and if pulsations of the abdominal aorta or femoral arteries are diminished or absent, then further search for the evidence for or against this diagnosis should be made, even including the x-ray. In other words teachers need to emphasize and simplify more than has been done, those sets of circumstances in which special procedures either simple or complicated need to be carried out.

I want to take this opportunity to express my lasting gratitude to Dr. J. H. Pratt, who first excited in me an interest in heart disease while I was an undergraduate student. I also wish to thank Dr. A. E. Cohn of the Rockefeller Hospital for first teaching me the experimental method as it might be applied to the study of cardiac problems. All this would not have been sufficient if my chief, Dr. Henry A. Christian, had not afforded me every opportunity during the subsequent years for developing these interests. I well recall the early days in 1913 and 1914 when Dr. Christian first set up the electrocardiograph in the Peter Bent Brigham Hospital, having no one to turn to when this part or the other would not function. After giving me my earliest instruction concerning this new apparatus and the subject of electrocardiography, he set me off on my own. From then on I have remained constantly in debt to him for his stimulus and guidance in my work.

Much of the joy and stimulus has come from the undergraduate students, whose insatiable curiosity and perplexing questions must ever keep the teacher's interest alive, and from the many house officers and resident physicians of the Peter Bent Brigham Hospital who have helped

me in these studies during the past fifteen years. We little realize the constant acquisition in knowledge that we experience from the casual and more spirited conversations with our intimate colleagues and medical friends. This is one of the most characteristic and laudable aspects of our great profession. Among a host of such friends I cannot refrain from acknowledging my enduring gratitude to Dr. Frank N. Wilson of Ann Arbor, Dr. Tinsley R. Harrison of Nashville, Drs. Paul D. White and Soma Weiss of Boston, Dr. R. W. Scott of Cleveland and Sir Thomas Lewis of London. From all I have learned a great deal.

I also wish to thank Dr. F. Van Nuys of Weston, Massachusetts and Dr. W. D. Stroud of Philadelphia for their help in reviewing the manuscript and giving me the benefit of their criticism.

Considerable time and effort have been saved by the kindly services of Miss Bertha I. Barker, who has done all the technical work in electrocardiography at the Peter Bent Brigham Hospital these past twenty years. I also wish to acknowledge my obligations to the Oxford University Press for permitting me to use some of the figures in Chapter XX that were previously published in their System of Medicine.

SAMUEL A. LEVINE

Contents

CHAPTER 1

Introductory Considerations

Considerable knowledge has been gained since the turn of the century concerning the normal and abnormal changes that occur in the heart and the peripheral part of the circulation. One may ask whether or not this knowledge has improved the methods of treatment in actual practice. This question is often put with the inference that therapy has remained at a standstill and that progress in our understanding, although interesting to physiologists and teachers and somewhat tedious to students, has merely made the subject matter clearer and has put diagnosis on a more positive basis. Even if the latter alone were true and heart conditions could now be diagnosed more accurately, a distinct advance of a practical nature would have been made. However, as will be demonstrated, prognostication, although still difficult, has become much more definite and, in certain respects, treatment more efficacious. There are now patients suffering from certain heart affections who are treated effectively, for whom improvement may be expected and, in some instances, health completely restored, whereas little more than a generation ago similar conditions were entirely overlooked or were improperly understood and utterly beyond the help of any therapy that was then available. It will become clear in subsequent chapters that even the ablest clinician of not so long ago was helpless before some of the problems that have since responded dramatically to treatment.

These advances have resulted from the more careful clinical study of patients, utilizing the common bedside methods of observation, the pathologic study of autopsy material, and the newer data available to us from the laboratory. With respect to the latter type of knowledge, we owe a great deal to the pioneer investigators, such as Mackenzie, Wenckebach, Einthoven, and Lewis, who established modern cardiography on a scientific basis as a result of the introduction of the polygraph and the electrocardiograph. The determination of basal metabolism in clinical work has also materially helped our therapy. These and other laboratory procedures have fortified our knowledge so that, as a result of their use, we are now successfully treating patients suffering from certain conditions that previously were regarded as hopeless. Reference is made at this point to the improvement of our knowledge and to the means by which the advance was obtained, to combat the view

that seems to prevail in the minds of many that laboratory methods have come to occupy too prominent a position in our medical study. An understanding of both the purely clinical and the more intricate laboratory aspects of disease is absolutely necessary for a proper approach to the diagnosis, prognosis, and treatment of heart disease, and the slighting of one method or undue emphasis of the other will diminish the accuracy and value of our work.

AIMS IN THE TREATMENT OF HEART DISEASE

At the outset, the proper aims in the treatment of heart disease must be appreciated. Unlike other conditions in medicine, most sufferers from heart disease cannot be cured. The disease generally is a chronic one, and the purpose of intelligent care is the prolongation of life, the diminution of suffering, and the increase of mental and physical efficiency of the patient. If the difference between correct and incorrect advice given to a patient with early heart failure is a matter of two to five additional years of life, then proper treatment renders much more aid than most of the unhappy sufferers of cancer obtain from the thousands of surgical operations that are performed for their relief. In addition, there is an increasingly large group of heart patients who present problems in which knowledge of the proper treatment saves life and effects complete restoration of health, whereas, with lack of that specific knowledge, fatalities occur. To be sure, such instances are still not common but are increasing in number. To the few who must inevitably succumb it is little comfort that these conditions are rare, and therefore we should be ready to render this invaluable service when the occasion arises.

There is a further aim to strive for in accurate study of heart disease which results purely from correct diagnosis. I have reference to distinguishing organic from functional heart disease. Many patients have been thought to have structural heart disease because of certain signs or symptoms that we now know are benign. Such error results in great and unnecessary economic loss and unhappiness and frequently in the perpetuation, aggravation, or actual production of a cardiac neurosis which might have been cured or prevented at the outset if the condition were properly understood. In other words, many patients with functional heart disease owe their disability to the inaccurate diagnosis made by some physician and to the effect produced by the fear and worry which such diagnosis engenders.

A final purpose that one hopes will be even more important in the future is the possible prevention or diminution in the incidence of heart disease which may follow a sound understanding of its problems. To be sure, the cry of prevention is constantly heard from the lay public and the medical profession. It seems that, with our limited available information, too much is being promised by our medical brethren with regard to the prevention of heart disease. Although much is being said, too little that is effective has as yet been accomplished, but the great importance of the subject warrants the tremendous agitation that is current.

NORMAL CIRCULATION

Before taking up the discussion of heart disease, it may be well to review briefly some of the simple events upon which a normal circulation depends. The main functions of the circulation are the distribution of oxygen and other nutrient and essential constituents through the capillaries to the tissues throughout the body, and the elimination of noxious products mainly through the lungs and kidneys. Let us at this point trace the different steps in the flow of blood within the body. The venous blood returning from the periphery enters the right auricle through the superior and inferior venae cavae. After an appropriate interval of diastolic filling of the auricle, during most of which time the tricuspid valve between the right auricle and right ventricle is open, the auricle contracts, and slightly less than one-fifth of a second later the ventricle contracts. It must be appreciated that most of the blood, in fact about seven-eighths of it, goes from auricles to ventricles during diastole before the auricles contract, merely because of differences in pressure in the two chambers and the effect of gravity. Only a last bit of blood is ejected by auricular systole, which gives the ventricle its final stretching before it contracts. When the right ventricle contracts, the tricuspid valve closes and the pulmonary valve opens. Blood is thereby sent through the pulmonary artery to the lung capillaries. There the essential change is the liberation of carbon dioxide and the absorption of oxygen in the alveoli of the lung, i.e., the venous blood becomes arterial. The blood then returns by way of the pulmonary veins to the left auricle. The same movement of blood is going on in the left side of the heart that was described above as taking place in the right side, from left auricle through the mitral valve to the left ventricle, only in the one case the blood is venous and in the other it is arterial. When the ventricles contract, the mitral valve closes, the aortic valve opens, and the arterial blood leaves the left ventricle through the aorta to enter the systemic circulation and to nourish the various organs of the body. The blood returns from the capillaries through the veins back to the heart, only to start the cycle all over again. The flow of blood is essentially a dynamic phenomenon and results from differences of pressure in one part of the system as compared with another.

The above events recur with a rhythmic regularity under normal conditions at about the rate of seventy times a minute. The disturbances in this rhythm that occur in certain normal and abnormal states are taken up in Chapter 21, familiarity with which is essential to a precise understanding of the treatment of heart disease. These events produce two heart sounds, the first and second heart sounds, that may well be described as lub-dub. The first heart sound is essentially the result of the contraction of the ventricles and the closure of the mitral and tricuspid valves; the second sound is the result of the closure of the semilunar valves (the aortic and pulmonary). It has been maintained by some investigators, notably Dock, that the first sound is entirely valvular and that the contracting muscle itself produces no sound. The

interval between the first and second heart sounds coincides with systole, and that between the second and first sounds with diastole. The length of the former is approximately two-thirds that of the latter. It will be seen later that in some cases, in order to avoid overlooking important findings in the heart which are to be heard by auscultation, it will be necessary for the physician to train himself to listen to one of the four features independently of the others. With a little training it is not difficult to dissociate from one's mind everything except the quality of the first or the second heart sound. Likewise, certain murmurs that occur in systole or diastole will be heard only if the mind is concentrated for a given length of time on the interval between the first and second heart sounds or on that between the second and first sounds. I have emphasized this particular point because important diagnoses have frequently been overlooked as a result of aimless and more casual auscultation instead of concentrating attention upon a single element at a time while listening to the heart.

FORMS OF HEART DISEASE

Before taking up any discussion of heart disease, it would be well to classify the general paths along which a heart may be diseased and the varying ways by which such disease may become manifest. A very common affection of the heart results from deformation of the valves. Such abnormalities may produce a regurgitation of blood through valves at a time when they should be closed or a constriction of the valves impeding the free flow of blood from one chamber to another at a time when they should be wide open. The point of view I should like to emphasize at this time is that damage to valves is of great importance in undermining the efficiency of the circulation apart from the health of the heart muscle. To express this somewhat differently: if we assume the valves to be seriously injured at a time when the heart muscle is normal, progressive heart disease and failure of the circulation may yet take place because of the mechanical embarrassment that exists.

A second form of disorder develops from changes in the musculature of the heart entirely apart from the integrity of the valves. Here, as a result of alterations in the coronary blood vessels or of more diffuse damage to the heart muscle from toxins or certain poisonous substances circulating in the body, heart failure may result. Good examples of this are coronary thrombosis or diphtheritic heart disease. Furthermore, the heart muscle may fail functionally, even when it is not significantly diseased, if there is marked hypertrophy. In this event the blood supply to the heart may be relatively insufficient for the thick muscle fibers. An entirely different form of heart disease occurs when bacteria start growing on the valves of the heart. Here the heart muscle may be normal and efficient and the mechanical embarrassment to the circulation as a result of the valvular deformations may be of trivial importance. The victim is nevertheless suffering from an affection of the heart which is always extremely grave. It must be clear, however, that in this

condition the disease presents itself with the picture of infection and sepsis and not as circulatory failure, whereas in ordinary myocardial or valvular disease the patients are apt to complain of varying degrees of shortness of the breath or chest pain.

Disease of the pericardium may embarrass the circulation either as the direct result of the inflammation that is present in acute pericarditis or by the mechanical impediment to the normal free movements of the heart that follows a pericardial effusion or pericardial adhesions. In much the same way extracardiac conditions such as thoracic tumors that produce pressure on the heart or great vessels or emphysema that produces increased pressure in the pulmonary circulation may affect the heart.

Another form of heart disease, which is comparatively rare, is that which results from congenital abnormalities. Here, as a rule, the musculature is essentially normal but the chambers of the heart, its valves or partitions, or the large blood vessels are improperly constructed. The result is either an impediment to the flow of blood in the normal manner or an admixture of venous and arterial blood because of defects in the septa that divide the right and left sides of the heart.

Apart from the foregoing structural changes that account for most forms of heart disease there are disturbances in the mechanism of the beat itself which present distinct problems in diagnosis and treatment. Such disturbances occur in normal people as well as in patients who also have structural disease of the heart. For example, a perfectly normal individual may suddenly develop a paroxysm of tachycardia under such circumstances that very disastrous results may ensue. Here the mere acceleration in rate enfeebles the circulation although there is no disease of the heart muscle or valves and no infection. A similar situation may develop in a patient who already has mitral stenosis. Then the embarrassment of the circulation may be more serious and develop more quickly. Such abnormalities in the mechanism of the heart may properly be regarded as functional and will be taken up in detail later.

A final condition which goes by a variety of terms also deserves consideration. I have reference to functional heart disease and cardiac neurosis. These conditions were very prevalent during the First World War and were known by one or another of the following names: soldier's heart, effort syndrome, disorderly action of the heart (D.A.H.), neurocirculatory asthenia (N.C.A.), irritable heart, functional heart, or nervous heart.

The disability of which the patient will complain in one form of myocardial disease may be quite different from that in another. Dyspnea is generally the most prominent symptom of cardiac failure whether it occurs in a patient with valvular or with myocardial disease; however, when there is localized coronary artery disease producing angina pectoris, there may be no dyspnea whatever and only chest pain. Likewise, the heart may be intoxicated as a result of hyperthyroidism without any dyspnea. Here the heart is actually hyperactive, and the primary complaint may be palpitation. The inference from all this is that there can