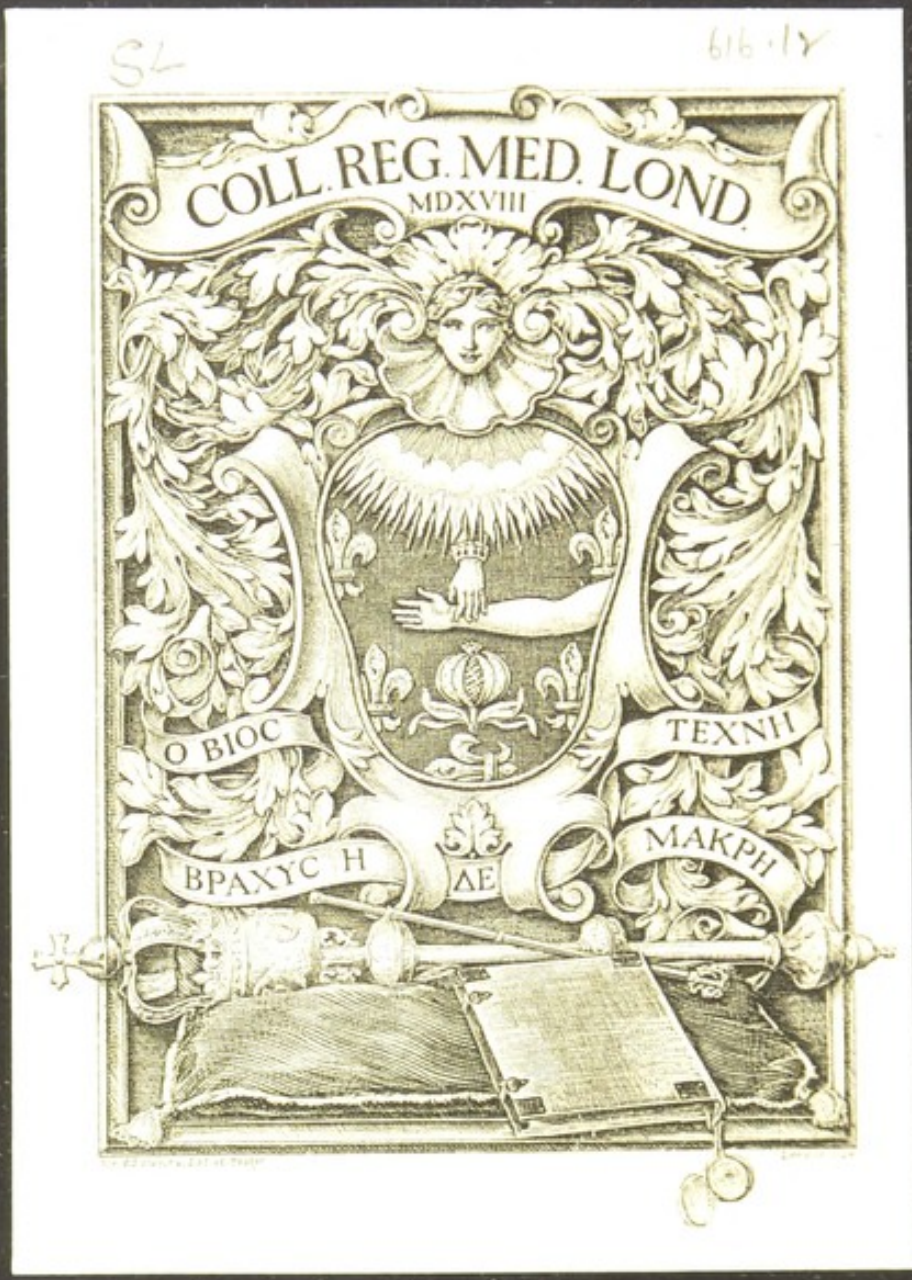
The Lettsomian lectures on diseases and disorders of the heart and arteries in middle and advanced life / by J. Mitchell Bruce.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HEART DISEASE

IN

MIDDLE AND ADVANCED AGE

The Lettsomian Lectures

ON

DISEASES AND DISORDERS

OF THE

HEART AND ARTERIES

IN

MIDDLE AND ADVANCED LIFE

Delivered before the Medical Society of London, Session 1900—1

BY

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—

1902

To

JOHN H. MORGAN, C.V.O., M.A. Oxon., F.R.C.S. Eng.

President of the Medical Society of London, 1900–1901

from his friend and colleague

The Writer

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THE LETTSOMIAN LECTURES

1900–1901

LECTURE I.

Mr. President and Gentlemen,—My first duty this evening is to thank you, which I do most heartily and gratefully, for the honour you have done me by selecting me to deliver the Lettsomian Lectures for the present year. My second duty is to spend as little time as possible on preliminary remarks, for—as you, Sir, know, having yourself occupied this distinguished place on a former occasion—three hours are all too brief for useful presentation of material which one has collected for a purpose like the present. In selecting the subject of my Lectures I was mindful of the character and objects of this Society. In the Medical Society of London there is a fuller blending of men engaged in family practice with men holding hospital appointments than is the case at most of the other learned societies connected with our profession in London; and there is here an opportunity for free communication of experience and interchange of opinion between these two classes of our Fellows which cannot fail to be profitable to both. Therefore, I have taken up a subject of thoroughly practical interest; and not only this, but I will attempt to present it to you, to put you in a position to look at it, from the point of view of the practitioner. The problem of the diseases and disorders of the heart and arteries in middle and advanced life may be said to come before the family practitioner every hour of his work, and to offer difficulties and create a sense of responsibility or even anxiety which are not sufficiently appreciated by the hospital physician. There comes before him the case of one of his patients, an active business man of 45, who has been seized with angina pectoris when hurrying to the station after breakfast, or that of an old friend, whose proposal for an increase of his insurance at 50 has been declined because of arterial degeneration and polyuria; or he is asked to say whether a man of 60, occupying an important and possibly

distinguished position in the community, ought to retire from public life because he has occasional attacks of præcordial oppression and a systolic murmur at the base of his heart. What, again, is he to do for the stout, free-living man, just passing the meridian of life, who consults him for weakness and depression, whose heart is large and feeble, and the urine saccharine and slightly albuminous? There is not one of my audience who has not met with such cases as these many times in his practice, and a variety of other cases of cardiac disorder and disease after 40, where the importance of the individuals, the value of their lives, and the gravity of their complaints and their prospects have exercised him very anxiously. What is the prognosis in cases of this order? What can be done for them in the way of treatment? These are the questions which we would desire to answer usefully. The answer, it seems to me, can be given only after an analysis and study of a considerable number of instances of the kind, in respect of their origin, their clinical characters and course, and the result. This is the method of inquiry which I propose to follow. It will be a study of cardio-vascular disease in older subjects from the clinical point of view, and it will be approached not only from the ordinary clinical side as it is approached in hospitals, that is, by an investigation of symptoms and signs, but also and especially in the light of that particular order of knowledge which the family practitioner has learned to appreciate and has so intimate an opportunity to acquire correctly —a knowledge of the origin or causes of the different affections, which it is always difficult, and often impossible, for the hospital physician to ascertain. For the same reason, although, to be complete, a study of the diseases of the circulation at and after middle life should include an account of the *post-mortem* characters found in fatal cases, and whilst the basis of the account I submit to you will be essentially pathological, I shall not attempt to describe the pathological anatomy and histology of this group of lesions of the heart and arteries. This part of the subject has been remarkably advanced during the last few years; and even if I had the time and the necessary knowledge to deal with it now, I should have nothing original in it to lay before you. Indeed, if I may venture to say so, our attention lately has been too much confined to the pathological states of the heart and arteries and too little directed to the causes which produce them. "Arterial sclerosis" is now an ordinary diagnosis in every-day practice, as if it were sufficient for

purposes of prognosis and treatment to have determined that the radial artery is thicker and longer and more dense than normal, without regard to the actual nature of the pathological change, whether strain, or syphilitic, or gouty, or otherwise. And in the same way the phrase "dilatation of the heart" is now in everybody's mouth, irrespective of considerations of its origin. Not only has the profession suddenly woke up to the recognition of a form of enlargement of the heart which was fully described fifty years ago by physicians in our own country, but the public have made "dilated heart" a fashionable disease which calls for the advice of a specialist and an annual visit to a Continental spa. We ought to have advanced beyond this stage of cardiac pathology long before this time. Besides, of how much greater interest is it in our every-day work to study the causes or circumstances that lead up to disease than the simple state of disease itself! And there is in a study of this kind an opportunity afforded to the family practitioner of advancing Medicine—scientific, preventive and therapeutical—as surely as if he were a pathologist in the *post-mortem* room or laboratory.

Before, however, examining the influences and circumstances which disorder and damage the circulation in middle and advanced life, let us see what the normal or natural state of the heart and arteries is after 40. It has been ascertained that the different parts of the circulatory apparatus pass through certain definite phases of change in the different stages of that decline of existence and energy which leads to senility and ends in death. We have to thank Professor Beneke, of Marburg, for the results of a laborious investigation of this subject which are generally accepted and which I will attempt to summarise.*

We should all expect the cardio-vascular system to undergo important changes with increasing age; but few of us would be prepared to find that these changes are neither uniformly progressive nor indeed continuously progressive in the same direction. To make more easily intelligible the nature and as far as possible the origin of these anatomical alterations in the heart and arteries during the second half of life, I will first refer for a moment to the circulation from 20 to 45. During this period of life the blood-pressure is relatively high, reaching its maximum about 36; the aorta and other large arteries increase in diameter from the

* F. W. Beneke, 'Die Altersdisposition.'

stress of the blood-pressure on their elastic walls, particularly between 35 and 45, and the heart increases in size year after year at a nearly uniform rate. We have in these facts anatomical evidence of the great functional vigour and activity of the circulation in manhood. At 45, which is practically the commencement of the period with which we are concerned, remarkable changes occur. Whilst the arteries continue to increase in circumference (somewhat more slowly than before), the blood-pressure falls and the heart begins—almost suddenly—to diminish in size; and these three features characterise the circulation for the next 20 years, that is, until the age of 65. How is this fall in the size of the heart to be accounted for? Partly by the widening of the arterial trunks and the consequent fall of pressure. But not by these only; for although the arteries had been widening even more rapidly between 20 and 45, the pressure was actually at its maximum then and the heart large, and we shall presently find other facts opposed to this view. The peripheral resistance in the systemic arteries must fall from some other cause or causes in middle age than the loss of elasticity of the arterial walls, and these causes are probably reduction of mechanical stress, due to comparative bodily relaxation, loss of vaso-motor tone in the splanchnic area, and the chronic diseases of which the subjects have died whose hearts and vessels are measured *post mortem*. During this phase of life also, the blood becomes more venous in quality and its hæmoglobin value is lowered.

At 65, other changes which occur in the heart and arteries are not less striking than those which I have just described. The decline of circulatory energy, and the effects of time itself on the protoplasm of the cells of the body, have so lowered the metabolic and functional energy of the tissues and organs and the activity of the blood-supply, that a considerable proportion of the capillary network becomes obsolete. The peripheral resistance is thus increased, and the blood-pressure rises; therefore the heart once more increases so much in size that at the end of the 10 years (age 75) it is found as large as it was at 45, and at the same time the hæmoglobin value of the blood again proves to be higher. During this period, also, the arteries continue to grow wider and thicker and longer—another proof that the size of the heart is not determined solely by their calibre. Regarded as a whole, the process of senescence of the cardio-vascular system presents to us a beautiful instance of

anatomical readjustment and compensation—the counterpart, in a way, of the growth of the circulation in energy and activity during the period of full manhood. The arterial walls, which have been stretched in their diameter and in their length by exhaustion of their elasticity under the stress of cardiac systole, are strengthened afresh by the development of stays formed of fibroid and muscular tissues in the intima and media; and the heart responds to the altered mechanical condition ahead of it in the arteries, and to the increased peripheral resistance caused by the obsolescence of many capillaries, by growing afresh.

This account relates to the size of the arteries after 40; now let us inquire what is the condition of their structural elements. The changes described do not necessarily involve disease of the tissue elements, unless we were to call every senile change morbid. My friends Dr. Bosanquet and Dr. Mullings have given me an account of the state of the heart and aorta in the bodies of 25 men, aged 40 and upwards, examined in the *post-mortem* room of Charing Cross Hospital, who had died from accident or suicide. The average age was 53½ years, and the aorta presented some degree of atheroma in half the cases. When we consider how very slight a change in the arch of the aorta is habitually described as "atheroma," and that in a few of the cases the valves were diseased and the heart enlarged, we are justified in concluding that in the majority of persons of 53 the arteries are still sound. This result is in accord with that obtained by the late Professor Humphry, who devoted his attention so long and so successfully to the investigation of old age. He states that in the great majority of cases the arterial system appears to present a healthy condition in those who attain to great age.* Even among the majority of centenarians the evidences of arterial degeneration were not manifest.† And we know that we occasionally meet with people of 80 and upwards whose pulses are unexceptionable, beyond presenting a trace of thickening and enlargement.

For my present purpose, therefore, we may conclude that as age advances, the arteries naturally become wider, longer and thicker, and altogether larger than in early life; and that we must not speak of "vascular degeneration" in an evil sense as often as we find these conditions present. As for the heart, we know that it may remain structurally sound, and is more often regular than irregular,

* Humphry, 'Old Age,' 1889, p. 23.

† *Op. cit.*, p. 48.

to the most advanced years of life. Conversely, these facts suggest that actual diseases of the arteries and heart, that is, other than the changes which are found in all persons after 45, are not properly senile in their nature. As Professor Humphry said, they are no part of, but are rather to be regarded as deviations from, or morbid departures from, the natural phenomena.* They must be the effects of pathological processes due to a variety of pathogenetic influences which assail the circulation. Now we are in a position to study these.

After the age of 40, many of the influences that threaten the heart and arteries with disorder and disease are peculiar to this period of life—that is, different and distinct from the causes of cardiac and vascular affections in childhood, adolescence and manhood; others of them have been encountered already, with or without permanent damage as the result. I will now examine them in detail, and at the same time refer to certain provisions with which the heart and arteries are endowed for resisting them and recovering naturally from their effects, as well as to the circumstances which render these provisions abortive or insufficient, and thus predispose to disease or indirectly determine its occurrence.

1. *Physical stress* is still a definite cause of cardiac and vascular damage during the second half of life, in the forms both of sudden violent exertion and of ordinary laborious occupations. I have met with instances of acute and serious strain at all ages over 40, up to and even after 70. I am aware that I must speak on this part of my subject—the evil effects of muscular exercise—with great caution in the presence of you, Sir, our President, who have long been recognised as one of the principal patrons in our profession of athletic sports, and so highly distinguished yourself in them at Oxford and in the inter-University contests. I assume that you are unwilling to admit that muscular exercise is dangerous to health. But I feel sure that you will agree with me that when the man of 65 rushes from his breakfast-table to catch his train, or the lady of 70 hurries up a hill in Wales to be in time for morning service, or the middle-aged father on holiday, who has just started a bicycle in order to reduce his weight, takes the pace from his son of 17, the effect on the heart and arteries is likely to be serious. I have notes of a good many cases of cardiac strain in middle-aged and old persons from cycling; a very few from violent efforts to drive at

* Humphry, 'Old Age,' 1889, p. 15.

golf; a few from efforts at lifting or resisting heavy weights; and one notable case in which a member of our own profession, a man of 45, belonging to the Royal Army Medical Corps, broke down with acute cardiac dilatation during General French's memorable ride to relieve Kimberley. In some of my cases there was no reason to believe that the heart was other than sound before the strain; but in a majority of them (and I have analysed 40, of which I have more or less full notes) one or more of the safeguards of the circulation against strain were already defective or wanting. What are these? In the heart, chiefly a high degree of extensibility or elasticity of its tissues, permitting over-distension of the chambers, with safety-valve action of the tricuspid in extreme cases, and a sound and vigorous musculature to effect the increased action, and if necessary the hypertrophy, which mechanical stress demands—in a word, healthy, well-nourished cardiac walls. It is an interesting fact that two-thirds of my cases of cardiac strain in the second half of life presented also a history of gout, fully developed or irregular—in other words, a history of perverted metabolism. Equally striking is another fact in this connection: that in many cases the occurrence of strain in middle or advanced age was but the latest of a series of similar events as the result of muscular effort for a period of 10, 20, 30, 40, or even 50 years—in other words, the heart had been strained originally in youth or early manhood, and had given serious trouble as often as it was taxed again. Rowing or running at college was in a good many instances given as the cause of the first strain. I need not do more than mention previous valvular disease, usually of rheumatic origin, as a condition powerfully predisposing to cardiac injury by physical exertion. Excepting in this indirect way, rheumatism has no effect in lowering the resistance of heart or vessels to mechanical stress.

The principal safeguard which the arteries possess against strain is, of course, the extensibility and elasticity of their tissues. Unfortunately the metabolic disorders, including gout, which we have just found weakening the cardiac walls, are amongst the commonest causes of arterial degeneration also; and the two influences—gout and strain—acting together no doubt are accountable for a considerable number of cases of atheroma and chronic arteritis. It naturally might occur to us that gout and exertion could not well be associated, but this very consideration serves to explain their mutual influence in straining the heart. It is unwise, ill-timed, ill-planned muscular

exercise that injures the circulation, most often on the part of the middle-aged man, who, awaking to the consciousness of growing fat and gouty, rushes inconsiderately to violent exercise for relief.

2. It is generally recognised that nervous excitement and other *nervous influences* tax the circulation; and endless phrases and expressions, articulate and inarticulate, testify to the universal belief in the close connection between the heart and the emotions. Quite recently Dr. Leonard Hill and Dr. George Oliver have demonstrated instrumentally the rise of blood-pressure that accompanies cerebral activity.* No doubt many cases of disorder and disease of the walls of the heart and arteries originate in distress, worry, anxiety and protracted suspense; and the connection is most often seen in middle and advanced life, because these depressing emotions fall most heavily upon mankind at this period. Of the instances which I have met with I will mention but one or two by way of illustration. A member of the Reform Committee at Johannesburg at the time of the Jameson Raid, who had been confined in Pretoria Jail, came home sometime afterwards with the ordinary symptoms and signs of fatty degeneration of the heart, and died suddenly on the street. A detective officer who had tracked suspects and criminals all over the world, facing great personal danger, and on one occasion had to convey a parcel of dynamite found near a Government office to a place of safety many miles away, came under my care later on with arterial sclerosis and cerebral thrombosis, for which no other cause but a life of adventure could be discovered. These were cases of actual disease of the heart and arterial system respectively; and I need not add that disturbances or disorders of the circulation, of every degree and variety, the result of nervous excitement or depression, come constantly under our observation, especially in women. I would particularly mention, however, a group of cardio-vascular troubles that lie between these two extremes. I have frequently observed that persons of anxious and energetic temperament, burthened with responsible work of a heavy, constant and prolonged character, when they break down, as they often do, present the clinical features of high tension: the pulse is full, the heart is large, the second aortic sound is loud and ringing; there is polyuria, and a trace of albumen may be found. This disturbance of the circulation, strongly suggestive of contracted kidney, is as common in women

* Leonard Hill, Allbutt's 'System of Me ine,' vol. xii; George Oliver, 'The Blood and Blood-Pressure,' p. 170, 1901.

as in men—for instance, in matrons of schools or hospitals. Nevertheless, however clear the direct connection between nervous strain and cardio-vascular disease may be in many instances, it is in other instances unreal, or more correctly indirect only. This is a matter of great practical importance. First, the nervous temperament often drives the subjects of it to physical overwork in the form of incessant and prolonged devotion to work, with insufficient hours of rest and sleep, and to unwise attempts to remove nervous exhaustion by violent muscular exercise, as we have just seen. In the second place, alcohol undoubtedly plays an important part in many instances regarded as overwork and worry and nervous exhaustion, both in men and in women—alcohol taken to enable more work to be accomplished, to steady the nerves, to promote sleep, to drive away care, or to relieve the faintness which it has itself induced. And thirdly, many of the complaints of nervous depression, lowness and worry are really due to gout, to influenza, and the like, which are at the same time the true causes of the cardiac symptoms.

3. What I have just said in connection with nervous causes of cardio-vascular affections brings us naturally to that important group of agents which may be summarily called *extrinsic cardiac poisons*—alcohol, tobacco, tea, coffee and lead. I will not dwell on this subject at present, for there is no need to prove the reality of the connection, and I shall have occasion to refer to some of these poisons at greater length under the head of diagnosis. Alcoholic heart occurs both in men and women; tobacco heart is extraordinarily common in our own profession, and common in clergymen and in retired members of the public services; tea-, coffee-, and cocoa- poisoning I have met with principally in students.

4. There can be no question but that by far the most prolific causes of cardio-vascular disorder and disease after 40 are *disturbances of metabolism*, including gout—at any rate amongst the middle and upper classes in this country. This period of life brings with it in many instances comparative relaxation from work, and a disposition to substitute quiet or even passive for active exercise; and whilst the demands of growth and development on the alimentary system have greatly declined, the pleasures of the table and ease generally are too often indulged in as a privilege of advancing years and the legitimate reward of previous years of work. The results are functional disorders of the liver, gout in regular and

irregular forms, gravel, and the many associated disorders of the muscular, nervous and other systems. At the same time the arterial tension rises, for the body possesses a physiological provision for eliminating the nitrogenous products of metabolism, whether normal or abnormal, namely, the kidneys, the vaso-motor mechanism and the heart. Stimulation of the vaso-motor centre by nitrogenous waste raises the arterial pressure; the heart is excited to more vigorous contraction (if necessary it hypertrophies); and the consequent polyuria washes the intrinsic poisons out of the system. Thus it happens that in metabolic disorders, from excessive or unwholesome eating and drinking, the heart, vessels and kidneys are kept under incessant strain; and, like other organs working under strain in the gouty subject, they are the readiest to suffer—first from disorders of many kinds, and ultimately, unless reform be enforced, from cardio-vascular degeneration and chronic Bright's disease.

Of the many cases of this kind that I have seen at all ages between 40 and 80 (and others before 40), the proportion of irregular gout to acute articular gout was about 3 to 2. Under irregular gout I include goutiness in its many forms—sick headache, eczema, sciatica, lumbago, acid dyspepsia, irritable bladder, asthma, insomnia, vertigo, depression, and the familiar complexion and appearance generally of "the gouty individual," all variously combined.

In other cases the metabolic disturbances come before us not as gout or even goutiness in the ordinary acceptation of the term, but in the forms of obesity, of diabetes, of gravel, of irregular albuminuria, and of the effects of large eating and free living in general.

5. *Syphilis*—that fruitful cause of vascular disease, and both directly and indirectly of cardiac disease—has by no means ceased to attack the organs of circulation after 40. Whatever the date of the primary infection, syphilis is a standing danger to the heart and arteries in the middle-aged man and even in declining years. Thus, in 11 cases belonging to this group, the average age at which they came under my observation (most of them but not all complaining of cardiac distress) was 55. All of these were men. I ought to add that in a considerable proportion of the cases either physical strain, alcohol, tobacco or Bright's disease was associated with syphilis in the etiology, and sometimes more than one of these.

6. For the man and woman of forty years of age and upwards, most of *the acute specific fevers* are affairs of the past. But the liability to several of them remains, and, very unfortunately, the liability to those acute specific processes which may attack the cardio-vascular system—influenza in particular, and less often typhoid fever, rheumatism, diphtheria and pneumonia, as well as septicæmia of different forms or kinds, which works havoc throughout the entire circulation. I should have had more to say under this head but for the fact that our distinguished Fellow and former President, Dr. Sansom, has thoroughly investigated it, and on more than one occasion laid the results before you.

7. I will not occupy your time this evening in tracing the origin of certain cases of cardio-vascular disease in middle and advanced life to *chronic affections* of different kinds. Besides the obvious effects upon the heart, blood and blood-vessels, of anæmia, exhaustion, &c., we meet with such grave lesions as fatty degeneration from pernicious anæmia and other blood disorders; profound circulatory derangements and occasionally valvular lesions in Graves's disease, and others.

8. I now pass on to *complex causes*. In addition to the definite and distinct influences which I have mentioned as threatening the heart in this stage of life, there are two which are intimately associated with other causes of cardio-vascular disease, but still deserve to stand out independently. The first of these is emphysema, and along with it other chronic affections of the lungs and pleura, which strain the right ventricle; the second is chronic Bright's disease, which similarly strains the left ventricle. I shall have frequent occasion to return to these two morbid states in different parts of my subject. I mention them here to give them the position which they deserve as influences that threaten the function and still more the structure of the heart and arteries. They are often associated with each other, and each or both of them with one or more of the unfavourable influences I have just enumerated, particularly alcohol, disordered metabolism and gout. And this brings me to the many instances in which the different influences that threaten the circulatory organs in middle and advanced life act together in different combinations. Alcoholism is equally common amongst the poor, whose circulation is subjected to mechanical stress, whilst it is impoverished by want; the well-to-do, who lead luxurious, sedentary enervating lives; and, as I have

already observed, the keen active business or professional man who overworks his brain on stimulants. In this country at least, gout appears to be all-pervading, and as an unfavourable influence on heart and vessels it often cannot be dissociated from alcohol, sedentary habits, worry, plumbism, Bright's disease and emphysema.

Thus, in our study of combinations of morbific influences we come to appreciate the evil effect of certain *occupations* upon the circulation in middle life. The business man is exposed to the unhealthy actions on his heart of confinement to a close office or shop, worry, irregular hasty feeding, alcoholic indulgence in connection with his trade or profession, and unwise attempts at violent muscular exercise at the week-end or in the holiday season; or he may be guilty of entire disregard of the rules of bodily and mental hygiene, and bring on in this way premature degeneration of his cardio-vascular system. Still more numerous are the causes at work in the production of "soldier's heart." We have but to picture to ourselves, if we can, the physical strain, the mental excitement, the bodily hardships—including exposure to both extremes of temperature—and the coarse fare which have been the lot of many thousands of our brave troops in the Boer war, to understand how the fighting soldier "ages" quickly, and, in particular, ages in his heart and arteries. Add to these unfavourable influences syphilis, alcohol and tobacco (which, unfortunately, must be added in many instances), and the chance of escape from disease of the circulation in the soldier is practically *nil*. But "soldier's heart" is also met with elsewhere than in the army. The clergyman from the slums of London or other great city, who has lived and toiled and—it may be said truly—has fought with various success through alternate periods of excitement and depression, and has thus suffered much both in mind and body, comes to us with high-tension pulse, a tortuous radial artery, a large heart and a systolic murmur over the aorta, and complains of an attack of angina. His wife, who has laboured in the parish for years (she is 76, and still active in her work of charity), has also a thickened radial artery, a large heart, and a systolic basic murmur, with no discoverable cause of these evidences of a diseased circulation but the life that she has led amongst the poor around her. Perhaps such cases of cardio-vascular disease might be most correctly said to be due to the wear and tear of life. They are met with also in the traveller or explorer, who has spent most of his life in search of adventure; and they are

found in a man who has never left home, but whose years have been filled with the toil and anxiety of his position as an owner of land, or with prolonged litigation.

Such are the principal natural influences which individually or in different combinations threaten or assail the sound heart and blood vessels after the age of 40. I have given but a broad, hasty sketch of them entirely from my own recent observations, and I know that I have omitted some which in your opinion might deserve mention, but which possess no special interest in relation to this period of life—for example, the agents of acute infections of the endocardium, and also new growths, pregnancy and parturition. Let me now sum up the results, and say that whatever changes the cardio-vascular system may present in middle and advanced life, beyond those which we have found to be natural to it at those particular periods, are pathological—the result of physical stress, nervous influences, extrinsic poisons, disturbances of metabolism, syphilis, acute disease, or chronic disease; or are associated with chronic nephritis, emphysema or different combinations of the preceding causes, with various occupations or positions in life, or with other influences of less importance. It is necessary, however, to qualify this statement in two respects. In the first place, the heart and vessels may have been so damaged already, that is, in early life, that they fall victims to influences which, whether in kind or in degree, would have been insufficient to produce idiopathic disease of these organs. This brings me to the subject of old-standing valvular disease (mostly rheumatic in origin), chronic strain, and adherent pericardium in middle-aged and old subjects. A considerable proportion of our cases are of this type, and they have to be mentioned here for the sake of giving completeness to the plan of arrangement, but they are outside the range of our immediate subject. In the second place, hearts and arteries at 40 that appear to the naked eye free from damage may be molecularly weak, and unable to offer effective resistance even to influences of an every-day character. I have now arrived at the last, and certainly one of the most interesting, of the causes of disease of the heart and arteries in middle and advanced life. There are some persons whose hearts and arteries cannot carry them through the wear and tear of what may be called ordinary life for more than 40 or 50 years. The vital energy of the tissues of these organs is exhausted prematurely;

they are already old at 45 ; degeneration of the muscle- and other cells sets in early, reminding us of the essential myopathic paralysis of children. This type of case is described as "family heart," for it also runs in families—three, four, five, or more members of which, as in a number of instances that I have observed, may have all died suddenly of cardiac disease—some of them at an early age. Similarly, it is not by any means unusual to find quite young subjects, say of 30, with vessels already much enlarged ; and I may add, equally young subjects with their lungs already emphysematous although there is no history of respiratory strain, reminding us of the very common association of emphysema with arterial sclerosis in old age. These cases of family heart and premature arterial sclerosis are the links that connect disease of the heart and arteries in middle and advanced life of definitely pathological origin with the genuinely senile changes in the tissue-elements which render existence untenable at last, and which may be said to be the result of the exhaustion of their nutritional activity by "the thousand natural shocks that flesh is heir to."

LECTURE II.

Mr. President and Gentlemen,—In my last lecture I presented to you a brief account of the condition of the organs of circulation between the ages of 40 and 75, and I then proceeded to direct your attention to the principal influences which may disorder and damage them during that period of life. I will now attempt to describe the clinical characters and course of the affections of the heart and arteries, as I have observed them, in connection with these different influences respectively—whether gout, mechanical stress, syphilis, or other. Thereafter, if time permits, I may be able to examine the different symptoms and signs individually in order to discover the value of each as a guide in diagnosis.

Now, as I have already pointed out, the causes of cardio-vascular disease in the second half of life are very often, indeed usually, complex. It follows, therefore, that if we desire, as we do most particularly, to discover the effects of each pathogenetic influence as distinguished from the others, we must begin our study with

the simplest, or purest, or most definite of all, and proceed from it towards those which are more difficult, as well as to combinations of causes. It is easy to adopt this method in our present inquiry.

Tobacco Heart.

We have in tobacco a single distinct influence at work; one that is universally acknowledged to affect the heart and vessels, and the physiological action of which is understood; one, further, that can be removed (perhaps not without some difficulty, for I have had a patient plead for his pipe with tears in his eyes), and certainly that can always be resumed with remarkable readiness—in a word, a most favourable subject of observation by experiment. It is well, too, to begin the study of tobacco heart in young men, whose circulation is still structurally sound, and thereafter to follow up the subject in middle-aged and old persons. Adopting this line of inquiry, I have found that the uncomplicated effects of tobacco on young healthy hearts, as they present themselves clinically, are: palpitation in every instance; a sense of irregular action,* post-sternal oppression and pain in half the cases; and in one out of every eight sufferers either angina or uncomfortable sensations in the left arm. Faintness or actual faints occurred in one-third, and giddiness and a feeling of impending death in a smaller proportion. Turning to the physical signs, the heart proves to be of ordinary size in 50 per cent. of the patients; in a few it is very slightly enlarged; the præcordial impulse is often very weak, but occasionally increased in force and frequency, and almost as often irregular as not; the pulse tension, with insignificant exceptions, I have always found low. Very interesting, in the light of what I shall tell you later on, is the fact that of 20 of these patients complaining of the heart not one presented a cardiac murmur beyond a weak mitral systolic bruit, varying with posture or cubitus. This is in accordance with the teachings of pharmacology—that tobacco acts on the terminal branches of the vagus.

Now we are in a position to study the tobacco heart in a man of 40; and again let us begin with a man who is sound, active, and healthy otherwise. He complains of his heart, and recognises

* A medical friend who has suffered from tobacco heart assures me that at one period he could distinguish the contractions of the auricles and ventricles.

willingly (for he belongs to our own profession), in the discomfort and anxiety from which he suffers, the penalty of having smoked for years the strongest and blackest tobacco that he could buy. Yet his heart is not enlarged, and the cardiac sounds might be described as ordinary were they not peculiarly irregular, the frequency changing every moment and a falter occurring at short intervals. There is not a trace of murmur to be found in connection with the valves and orifices. At ages over 40 a clinical study of the tobacco heart is highly instructive from a practical point of view. Whilst palpitation is still the common complaint, pain, including angina, is put forward more prominently, and so are faintness, actual faints, a feeling of impending death, and a sense of cardiac irregularity, each intermission being accompanied with a sudden stab through the præcordia. Some of you will remember Mr. Barrie's quaint account in 'My Lady Nicotine' of what he calls the horrors of his smoking days, when the pain at his heart made him hold his breath—"a sting" as he describes it, and he believed he was dying. In these subjects the heart is more frequently found to be large and feeble; the same weak systolic murmur is occasionally to be heard; the radial pulse is often irregular, and the vessel wall naturally thick. This, you will notice, is a combination of symptoms and signs sufficient to alarm the casual observer. But when we examine it more deliberately, in the light of our study of the tobacco heart in young subjects, on the one hand, and of our knowledge of the normal or natural condition of the heart and arteries at 60, on the other hand, we are able to reassure ourselves and our patients. We are justified in concluding not only that every cardio-vascular lesion which may be found in tobacco smokers is not to be put to the credit of tobacco, but, *vice versâ* (and this is of more interest to us in our present inquiry), that every præcordial pain, angina, faintness, or irregular pulse in a man of 60 with a full-sized heart is not to be hastily regarded as evidences of grave disease without further inquiry as to his habits. The cardiac enlargement and large pulse may be nothing more than the result of a life of bodily and mental activity: the præcordial distress may be the result only of tobacco. How very necessary this caution is will be impressed upon your consideration by the two following cases. The first is that of a man of 60, actively engaged in professional pursuits, who first suffered from præcordial pain of an alarming character four and a half years ago, and has had

attacks since, particularly during exertion and after meals. One day last autumn, at the end of many hours' hard work, cheered by at least 18 cigarettes, he was rushing off to dine with a friend when he was suddenly seized with præcordial pain which he described as fearful, radiating down the left arm. He broke into a cold sweat, thought that his last hour had come, and for a short time had impairment of consciousness. Shortly after this event he took the advice of his doctors and gave up tobacco (shall I say for a time?), and from that day to this, now six months, he has had no further trouble with his heart.

The second case is equally striking. A man of 55, of fairly active disposition and somewhat full habit of body, was suddenly seized with angina pectoris in October, 1899. The pain was of a dull bursting character over the region of the heart, and it passed into the left shoulder, down to the elbow, and settled particularly in the wrist. At the same time there was pain in the upper maxillary region. The heart slowed down from 75 to 50, and the sufferer felt that he was dying. From that time anginal attacks occurred in rapid succession, five, six, nine or even eleven in a single day; occasionally they came on in the night. This experience continued for nearly two months on end; indeed, it was six months before the angina finally ceased. It was instantly relieved with amyl nitrite; nitro-glycerin was unsuccessful. In the course of giving advice to this patient I fortunately discovered that he had just laid in a stock of 2,000 cigars. The line of treatment was obvious; and the result has been, as I have said, complete recovery.

I have dwelt on the subject of tobacco heart perhaps longer than was necessary, addressing, as I am, a meeting of practitioners of experience and not a class of clinical students. I have done so to bring home to us an important consideration which we are all apt to overlook in diagnosis and still more in treatment, namely, that whether in an ordinary senile heart, or in a heart that is the seat of chronic valvular disease, or in arterial degeneration, something more than the pathological changes have in many instances to be regarded — usually some entirely adventitious disturbance which alone calls for treatment, such as indigestion, flatulence, worry, a bronchial catarrh, or it may be free indulgence in tobacco, tea or coffee.

The Heart in Alcoholism.

Let us now pass on to consider, from the clinical point of view, the effect on the organs of circulation of another morbific influence of a definite kind, namely, alcohol, or perhaps more correctly alcoholism, leaving on one side the questions of form and strength of the drink taken and its purity.

The direct effects of alcohol on the heart and the blood-vessels are by no means so easily determined as those of tobacco. In the first place, they are complicated with the many indirect effects which it produces on these organs by deranging the functions of alimentation and assimilation, the nervous system and the kidneys, and with the secondary effects on the vessels and heart of chronic nephritis due to the same cause. In the second place, as we saw in my first lecture, alcoholism is very commonly associated with nervous strain, with gout and goutiness, with tobacco, with syphilis, and not uncommonly with two, or more, or all of these together. Eliminating as far as possible these sources of error by careful selection of cases, I find that the alcoholic heart in middle and advanced life presents clinical characters, as a whole, very different from those of tobacco heart, which we have just studied. The most striking and important of these are the evidences of actual pathological change in the size of the heart and the condition of the myocardium. We found no evidence that tobacco causes serious cardiac enlargement, and neither may alcohol in quite young subjects, who present mainly excited action both in force and in frequency. But of 28 cases of alcoholic heart which I examined clinically in connection with the present inquiry in older subjects, only two hearts were of ordinary size (and as a matter of fact both of these patients were under 40 years of age). This result is in accord with my pathological observations. For instance, I have carefully followed the condition of the heart in an intemperate man of 43, and *post mortem* found the heart to weigh 17 ounces, to be universally dilated in all its chambers, and to present enlargement of the mitral opening without valvular lesion, corresponding with a weak apex systolic murmur heard during life. These results are also in accord with those in Dr. Maguire's cases of acute dilatation of the heart from alcoholism, which he recorded as long ago as 1888* (when, I may add, doubts were expressed of the

* Maguire, 'Trans. Clin. Soc. of London,' vol. xx, p. 235.

correctness of his conclusions by several of our best authorities on cardiac disease), and one of which occurred in a man of 23. Dr. Mott has found fatty degeneration of the myocardium in patients dying suddenly during alcoholism.* With hardly an exception the præcordial impulse is weak—indeed, it is often imperceptible; the sounds are small and feeble, and may be almost inaudible; in 20 per cent. of my cases a weak apex systolic murmur could be heard, varying with posture and from day to day, significant, no doubt, of leakage through a dilated mitral opening. The alcoholic heart is irregular and accelerated in about half the cases. The pulse tension is usually low; in one-third of the instances the radial artery was sclerosed; in one-fifth of them there was slight albuminuria; the legs may be œdematous. The complaints which the patient makes to us are commonly of palpitation of the heart, faintness or actual faints, and præcordial pain; but it is very interesting to observe that angina pectoris is rare in the alcoholic as compared with the tobacco heart, in the ratio of 4 to 15 per cent. With these cardiac symptoms proper there are usually associated the sweats, coldness of the extremities, and depression, sinking or lowness characteristic of alcoholism. But it is unnecessary for me to fill in this outline sketch of the condition of the victim of either acute, or sub-acute, or chronic alcoholism. I would rather mention one form of acute alcoholic failure of the heart of which I have recently seen a case, but which appears to be rare. A middle-aged woman, at the end of each of her repeated bouts of active alcoholism, has violent sickness; prostration passes into collapse, and for 24 hours or more she lies flat on her back, with all the phenomena of what may be called acute air-hunger. She breathes loudly and deeply, at the rate of 36 per minute, with groaning expiration. The expression is alarmed, despairing and imploring; the nose is pinched; the surface is livid and cold; the breath is cold; the pulse is practically imperceptible at the wrist; and yet the præcordial impulse is both strong and extensive, and the rate of the heart greatly accelerated. The condition is at once one of collapse and urgent dyspnœa, quite as in one form of so-called diabetic coma; and it is further remarkable in that it may pass off suddenly after having lasted, as I have said, for many hours. It is difficult to resist the conclusion that in such

* Mott, "Cardio-Vascular Nutrition and its Relation to Sudden Death," *Practitioner*, xli, p. 161.

a condition as this some product of alcohol, present in the blood, is the cause of the remarkable phenomena.

The course of alcoholic heart in older subjects usually becomes affected by the appearance of cirrhosis of the liver, Bright's disease, neuritis, and possibly dementia. The method of termination is very various, including ordinary cardiac failure with dropsy; and sudden death occasionally occurs. Still, recovery is far from being impossible, even after dropsy has made its appearance, for the size of the heart may decline under strict abstinence from alcohol, and the œdema disappear. This is a matter of great practical interest, inasmuch as we know that, whilst the effect of alcohol on the heart and circulation is for a time functional only, it presently becomes truly nutritional, as in the cases I have just narrated. The myocardium is not always beyond repair, although it and the fine myelinated fibres of the vagus undergo fatty degeneration according to Dr. Mott,* just as there are changes in the pyramidal cells and fibres of the cerebral cortex in the alcoholic; and the feebleness and irregularity of the heart are analogues of the depression and confusion of the brain.

Gout.

Of the many instances of disorder and disease of the heart and arteries that I have met with in gouty subjects at or over 40 years of age, I have made a careful study of 29 taken from my private case-books. Twelve of these (10 M. + 2 F.) had suffered from ordinary articular gout, the other 17 (6 M. + 11 F.) had irregular gout, as defined in my first lecture. The average age was 62. In no instance was there albuminuria. The physical condition of the heart and arteries and the patient's complaints were remarkably alike in the two groups. In 23 of the 29 the heart proved to be enlarged, either on one or both sides. In less than half the number the cardiac action was feeble; in a small number the impulse was entirely imperceptible; the heart- and pulse- rate was ordinary; the rhythm was but seldom irregular. It is a very remarkable fact that in no fewer than 12 out of the 29 cases of gouty heart a systolic murmur was to be heard over the aortic area, the manubrium and the right carotid, significant of disease either of the aortic arch or of the aortic valves—in every instance independently of rheumatism or other obvious cause than gout. This result is an interesting

* Mott, 'The Croonian Lectures on the Degeneration of the Neurone,' p. 110, 1900.

confirmation of the pathological observations of Dr. Norman Moore and Sir Dyce Duckworth given by the latter,* and of the statement of Murchison† of his experience "that atheroma of the arteries at an unusually early period of life, and diseases of the aortic valves which are not congenital, and are independent of injury or rheumatism, are met with far oftener in persons who are the subjects of the lithic acid dyscrasia, or who have had gout, than in those who have had no such tendencies." In seven (25 per cent.) of my cases a more or less developed systolic murmur was found in the mitral area, significant either of valvular atheroma and sclerosis or of leakage from ventricular dilatation. Very curiously I have never met with aortic incompetence of gouty origin. When no murmur exists the cardiac sounds are commonly somewhat feeble, and the second sound may be of ringing quality—this more commonly in goutiness than in developed gout. In agreement with this connection, the radial pulse is more often tense in the subjects of irregular than of regular gout‡; altogether, high tension is found in more than one-half of the cases. The great majority presented distinct thickening of the arterial walls. As I suggested in our study of the etiology, these pathological changes appear to be the result of malnutrition of structures (the myocardium, valves and arteries) worked at high pressure; and in addition to the local disturbance of metabolism in the cardiac and arterial walls, which are fed with gouty blood, there is the damaging effect on them of similar disease of the *vasa vasorum* and *vasa cordis* or coronaries.§ Besides a distressing feeling of irregularity, fluttering or intermittency, and dyspnœa on exertion, men who are the subjects of gouty heart complain most frequently of præcordial pain; women more often of palpitation and faintness or actual faints. In quite one-fourth of all cases of gouty heart the pain is anginal, and such angina may be of the most pronounced type. A friend of my own, aged 60, began to suffer from gouty angina (diagnosed to be such by his family physician 40 years ago) at the age of 20. Almost every year, somewhat more frequently for the last 12 years of his life, he was liable to be seized with intense pain in the left side of the chest, which rapidly extended to the neck and down the left arm, with

* Dyce Duckworth, 'A Treatise on Gout,' 1889, p. 108.

† Murchison, 'Clinical Lectures on Diseases of the Liver,' 3rd edition, 1885, p. 637.

‡ *Cf.* Clifford Allbutt, "Selections from the Lane Lectures," *Philadelphia Med. Journ.*, January 27th, 1900.

§ Mott, *Practitioner, loc. cit.*, p. 169.

tingling in the hand; a sense of great constriction in the chest; faintness, and difficulty of breathing. He had immediately to rest, whereupon the distress subsided; but it did not perfectly disappear for hours. On different occasions also, in connection with these anginal seizures, I have known him have free hæmoptysis, complete unconsciousness, vomiting, and sudden violent evacuation of the bowels. He also suffered from articular gout, and from irregular gout in almost every possible form.

Obesity and Glycosuria.

Closely related to goutiness is a clinical type of disturbed metabolism, mainly characterised by corpulence, a bulky, flabby build, and glycosuria. Of this type, represented by 12 cases in my series, nine had glycosuria and two albuminuria; eight were men; the average age was 58. Only one had suffered from true articular gout. Here, again, the interesting observation was made that no less than three-fourths of the number had a systolic aortic murmur, none of them a regurgitant aortic murmur, and nearly one-half of them an ill-developed mitral systolic murmur. Thus there appears to be more liability to atheroma in the gross corpulent diabetic even than in the gouty man. In all the cases the heart appeared to be enlarged, but accurate physical examination is difficult or impossible in many of these subjects. The impulse was more often feeble than in the gouty; the cardiac sounds were equally weak, and the second aortic sound was occasionally accentuated. The pulse corresponded with the gouty pulse in thickness and tension, but it was more often found irregular and hurried. As for the complaints of corpulent and diabetic patients, they prove to be very similar to those of gouty individuals in respect of pain, but neither palpitation, faintness nor irregularity was so often mentioned.

It must not be understood from what I have just said in my account of these cases that all disturbances of the heart in gouty subjects progress to valvular or vascular degeneration, with associated cardiac enlargement and degeneration. The friend whose case I have just described at some length had led an active life, as I said, for 40 years; and, as I hope to show in my next lecture, the condition is amenable to treatment if this is based on a correct appreciation of the cause that is at work. But it is equally true that if correct advice be not given, or if it be given but be

neglected, as happens so frequently, the endocardium and the aorta and other arteries steadily degenerate, chronic interstitial nephritis makes its appearance, and the patient dies either slowly from cardiac failure or suddenly from cerebral hæmorrhage.

Cardiac Strain.

I will now proceed to consider the clinical characters of a class of cases in which you, Sir, are particularly interested—strain of the heart in middle and advanced life. To make this part of my subject more plain, I will discuss in the first place acute strain of the heart as it occurs after the fortieth year; afterwards I will consider the condition of the heart and arteries at this age in persons who have strained them in youth or early manhood.

A man of 65, who came to me complaining of his heart, gave the following account of the commencement of his trouble:—Four years previously, on making a very hard stroke at golf (the ball was bunkered), he was suddenly seized with a sensation of something having happened in his heart. He played up to the next hole, but now felt the chest oppressed; he sat down and got relief. This experience was repeated, and he gave up the round. Walking home two miles, he had to sit down occasionally with the same feeling. Ever since that occurrence exertion had produced the same effect. I found the ordinary physical signs of enlargement of both sides of the heart; a scarcely perceptible impulse; the cardiac sounds extremely feeble, the second being of a finely ringing quality; the pulse tense, quiet and regular, but the radial artery by no means sclerosed. The patient's principal complaints were of irregular action of the heart, which troubled him on lying down or when he was dyspeptic; and, as I have said, of post-sternal oppression on exertion. This man had neither albuminuria nor emphysema, but he had frequently suffered from ordinary articular gout. Belonging to this type of cardiac strain I have notes in all of 11 cases, which I will briefly summarise. Eight were men, three women; and their average age was 56. In all but one of them the heart was large, with feeble præcordial impulse; the sounds were small and feeble; the aortic diastolic sound was often ringing; in but one case was there a murmur—aortic systolic; with few exceptions the rhythm and the rate of the heart were ordinary. In half the cases the radial artery was sclerosed; in the majority the tension

was not increased. Persons who strain their heart after middle life chiefly complain of præcordial oppression, dyspnœa on exertion, a sense of palpitation and irregular action of the heart, and pain, which may amount to angina; and they may tell us that distress and disability in these different forms have troubled them for years. You will have observed that the man whose case I have read in particular was the subject of gout; and this brings me to the interesting fact that of these 11 individuals seven were gouty. We have already seen how greatly reduced is the resistance of the cardio-vascular system in gouty subjects; and we are prepared for the readiness with which their heart may be strained by exertion—a matter of obvious importance prophylactically. In other cases not included in this group the strain took the form of valvular injury, or it affected hearts already the seats of old-standing valvular lesions of rheumatic origin; but the present is not the occasion to discuss these. Nor need I add that a not infrequent result of acute strain of the aged heart, whether its valves have been already damaged or its myocardium badly nourished, is sudden death. Now, I can understand that some of my audience might object to the application of the term "strain" to the effect of exertion in gouty and senile hearts, just as Professor Clifford Allbutt, who is universally recognised as the earliest and highest authority on this subject, suggests that the clinical expression "strain of the heart" relates only to comparatively young subjects free or nearly free from degeneration.* It might be contended with great reason that exertion in these subjects is not a cause of strain or dilatation of the heart, but simply a test, as it were, or the proof, of cardiac debility and disability. But when we come to consider cardiac strain a little more closely, it may be just as easily maintained that every dilated heart, every dilated cardiac chamber, every dilated blood-vessel has been strained. Whether, on the one hand, valvular disease, Bright's disease or emphysema, or, on the other hand, myocardial degeneration, has disturbed that cardinal condition of a normal circulation that the driving power must always exceed the resistance ahead, over-distension and dilatation of the cavities, with excessive stretching of their walls, constitute or consist in mechanical strain. However, laying aside theoretical discussions of this character, the great practical fact remains, that when the aged and ill-nourished heart is over-distended from sudden and severe

* Clifford Allbutt, 'System of Medicine,' v, p. 843.

exertion, neither the elastic nor the muscular tissues of its walls can bear the strain; it becomes dilated; for the future it acts at a mechanical disadvantage; and as often as this may occur it suffers still more in its efficiency. On the other hand, it is really in confirmation of this consideration, though apparently in opposition to it, that the heart may diminish somewhat in size, and præcordial distress disappear, under strict treatment continued for a sufficient length of time.

Strain before Forty.

A more interesting group of cases than those which I have just discussed is composed of persons who have strained their hearts in youth or early manhood, have never been quite well since, and in middle or advanced life are at last driven to us for help. Cases of this character would furnish excellent material from which we might attempt to judge of the after-effects of excess or abuse of muscular exercise in the young. This is a tempting subject of discussion, but one far too long and much too important to be taken up casually at this time. Therefore, I will content myself with submitting to you as plainly as I can certain facts bearing on it that have come before me in my present inquiry, along with a few simple observations of a practical bearing. First, then, let me read to you the history of what I should call a typical case of the kind. A man of 69 complains that as often as he walks any distance or climbs a stair he is arrested by a distressing sense of having a bar across the lower end of the sternum, breathlessness, irregular palpitation of the heart, and a very little choking in the throat; the discomfort has lately deserved the name of pain. His heart is very large, the area of præcordial dulness being increased in all directions and measuring transversely 7 inches. The impulse is weak over the left ventricle, but definite in the epigastrium; the sounds come in couples—moderately good and very weak respectively, without murmur; and the radial artery is large and thick, with rather low pressure and irregular rhythm. It turns out that for the last 40 years these uncomfortable feelings have troubled the man more or less, and that at three different periods of his life—at 31, at 42 and at 67—they increased so much as to incapacitate him for many months, the first time with a sudden sense of something snapping in the heart, the second time with a faint, and always, as he believes, consequent on overwork. Now this man never had rheumatism, nor gout, nor

syphilis, and was always a temperate, careful liver; and he volunteers the statement that he first felt his heart at Cambridge, where he was captain of his College boat, and was tried for the University boat but felt that he was not fit for it. Belonging to this type of cardiac strain I have selected 11 cases. The heart is always found to be enlarged, and in about one-half of the cases it is irregular. It may be weak and beating at the ordinary rate, but in other instances it is increased both in force and frequency. Only in quite exceptional cases did I meet with endocardial murmurs in this group of old strained hearts; as a rule the sounds were ordinary, with a disposition to accentuation of the aortic second sound. High tension and sclerosis of the radial artery were respectively found in about one-half of the cases. The patients complain most commonly of a distressing sense of irregular palpitation of the heart, and very commonly of præcordial pain, but rarely of angina. Faintness also is sometimes mentioned. Let me hasten to add, with respect to these cases, that they do not include any instances of direct injury of the valves mechanically. Rupture or stretching of the aortic and mitral valves during exertion furnishes us with some very remarkable clinical cases; but it is with parietal strain that we are concerned now—mechanical over-stretching of the cardiac walls, which are thereafter left with but a narrow margin of the elastic and muscular reserve required by them to meet trying circumstances of any kind, particularly exertion. The subjects of dilatation of the heart from mechanical stress suffer by no means from what is commonly called "heart disease," excepting in the worst cases, but yet they feel their hearts comparatively, and it may be seriously, disabled. Naturally they associate these feelings of disability with fresh attempts at exercise or exertion, as in the case which I have just read. I pointed out in my first lecture that such exertion is not by any means connected with the patient's occupation or daily duties, but quite often occurs during unwise attempts on his part to resume at 50 the athletic exercises of his youth in order to reduce his weight, relieve his liver, or dispel gout. It is not wonderful that under such circumstances a permanently enlarged and badly-nourished heart should become embarrassed, or even seriously deranged or still further strained. I have known a man of 43, going straight from London to the Alps, have not only præcordial distress but dropsy of his legs after his first ascent in his regular holiday. Indeed, the man who has reached later middle-life with

his heart enlarged by years of great bodily activity in youth, and settles down quietly on retirement, let us say from the navy, sometimes finds that ordinary exercise is sufficient to produce alarming cardiac distress and curious loss of courage, obviously due to the muscular tissue of the thickened cardiac walls having fallen quite out of condition. How instructive, for instance, is the following case:—A gentleman of 60, who has led from his boyhood upwards a life of physical activity and at the same time of temperance, and has suffered from neither syphilis nor rheumatism, but possibly from a very mild attack of gout, settles in a relaxing provincial town, continues to eat heartily, and considers that a little work in the garden is sufficient exercise for him. He increases in weight, his breath gets short, his heart flutters, and now he begins to get anxious about his health, fancying, as he says, that he has all sorts of diseases—a disposition to worry about himself which is entirely new and provoking to him. I find his heart very large and feeble, the cardiac sounds scarcely audible, and in the mitral area a well-developed systolic murmur. The patient is ordered to reduce his diet as a whole and in respect of carbo-hydrates, to return carefully to walking exercise on the level, and to take a calomel purge followed by a saline twice a week, and a mild strychnine mixture. He improves, and continues to do so; is able to walk miles without discomfort; and in the course of two months not only do I find his heart reduced in size on physical examination, but I fail to hear the apical murmur, which must have been produced by dilatation of the left ventricle. The bearing of such a case as this on the pathology, prevention and treatment of certain cases of heart disease in old subjects will be obvious to all.

We must be careful, however, to observe that neither unwise abandonment of wholesome exercise, nor ill-advised return to physical exertion, separately or in succession, can be regarded as the only cause of the recrudescence of cardiac distress after 40 in those who have strained their circulation in youth. Any one of the many circumstances that produce cardiac failure and dropsy in chronic valvular disease may lead to embarrassment and fresh dilatation of the simply enlarged heart: anæmia and chronic disease, the acute specific fevers including pneumonia, emphysema, granular kidney, gout, syphilis, tobacco and alcohol poisoning, as well as anxiety and worry, and in women the advent of the menopause; and I may say here parenthetically that pains at the heart in athletic youths are

sometimes due to the tobacco smoking in which they often indulge socially when the exercise is finished—not to strain at all. In these cases of old cardiac strain, as in every form of chronic valvular disease and of chronic heart disease of all kinds, not only the original and permanent lesion, but the recent and probably temporary circumstance that caused the failure has to be ascertained and fully respected in connection with prognosis and treatment.

Syphilis.

Syphilis appears to account for a very considerable proportion of the more serious cases of heart disease which we meet with in older subjects—excluding of course chronic valvular disease originating remotely in endocarditis. But I ought to repeat here what I have already mentioned, that syphilis as a cause of cardio-vascular lesions is very often associated with other morbific influences, particularly strain and alcohol. Of its position as the principal cause of grave disease of the valves as distinguished from the walls of the heart, originating in middle life, there can be no question. No fewer than nine out of 28 cases, of which I have private notes, were the subjects of double aortic disease; practically all the others had a loud ringing second sound over the aorta, significant of degeneration; pain of anginal type in half the cases was the prominent complaint; and two-thirds of the subjects had sclerosis of the radial artery. When we consider that syphilis does also affect the myocardium primarily; that fibroid disease, chronic aneurysm and fatty degeneration of the heart are all traceable to specific disease of the coronaries in many instances; and, finally, that many of the subjects of syphilitic cardio-vascular disease have perished before 40, the magnitude of this cause can be fully realised. I believe that the profession in general have not yet woke up, if I may say so, to the gravity of this subject. How seldom we inquire for a history of specific disease in patients coming to us with cardiac disease in middle life! To no one, as far as my reading goes, are we so much indebted for the truth on this subject as to my friend and colleague Dr. Mott. Thirteen years ago he published a paper on 21 cases of sudden death from cardio-vascular disease, and in nine of these there was a history of either actual or probable syphilis. What was of greater interest, however, at that early date, he drew attention to the association of syphilitic cardio-vascular

lesions with Bright's disease in the broad acceptation of the term. Dr. Mott's work in the interval on syphilitic lesions of the arterial system of the brain has been so brilliant, and is so generally known, that it requires nothing more than this appreciative mention by me, and it saves me the trouble of an excursion into the subjects of cerebral hæmorrhage and thrombosis in connection with these lectures.

Nervous Strain.

I confess that it is difficult to say much that is of real diagnostic value on the clinical aspect of cardio-vascular disorders and disease from nervous strain. As I remarked in discussing this subject from the etiological point of view, several factors come into play besides nervous excitement followed by exhaustion and their effects on the heart, great vessels and cerebral arteries; and the cases, therefore, are found to present a puzzling variety of features. Certain clinical characters are, however, common to the majority. Arterial tension is high; the radial artery is thick, sometimes markedly so; the heart enlarges; and in about one-half of the cases a systolic murmur is to be heard either in the aortic or in the mitral area, significant of chronic endocardial lesions—all readily intelligible results of cerebral strain in the light of our knowledge of the innervation of the cardio-vascular system. I have already pointed out that in some of these patients polyuria and temporary albuminuria occur along with the high tension and the increased action of the heart; but the heart may fail later on. The direct cardiac symptoms of which they complain are of the ordinary character, palpitation with accelerated cardiac frequency and pain (not angina) being the most common at first, feelings of indescribable discomfort and suffocation in the more advanced stage. A great deal that I might have had to say on the very interesting subjects of pseudo-angina, and the climacteric and pre-climacteric disturbances of the circulation in women, I am reluctantly compelled to omit from want of time.

After having reviewed, as I have attempted to do, the principal clinical characters of the disorders and diseases of middle and advanced life under their several causes, it may appear for a moment strange that the most important of all the clinical types of cardio-vascular degeneration has been mentioned only incidentally. This is chronic Bright's disease, which, from its complex pathological relations, its widespread effects on the heart and

circulation and the organs that they supply, and the far greater gravity of these than those of any of the other causes which we have studied (unless it be syphilis), is a subject of endless interest to us all. Fortunately for me my immediate predecessor in this chair on the medical side, our distinguished Fellow, Dr. Samuel West, took for his subject the "Clinical Aspects of Granular Kidney," and thus relieved me of a task which he was so much better able to discharge than I. Emphysema must also be passed over with the single remark that it is a very common accompaniment both of vascular and cardiac degenerations.

I trust you do not conclude that the description which I have just given you of the clinical characters of these various disorders and diseases of the heart is in any sense complete. It only relates to the most prominent symptoms and signs as they present themselves to us in what might be called the every-day life of the patient, at a period in the history of his case precedent to failure. In all of them there may occur occasional attacks of acute embarrassment of the heart and lungs from one or more of a variety of causes, such as indigestion, excitement or over-exertion. Sooner or later, also, there occurs either cardiac dropsy—insidiously developed after increasing local distress, growing dyspnœa and "bad nights"; or Bright's disease; or cerebral thrombosis or hæmorrhage, or acute myocardial failure with angina: or the patient dies from failure of the heart in the course of some acute disease such as bronchitis or pneumonia. Neither have I considered it necessary in this lecture to dwell on some of the rarer phenomena occasionally met with, such as tachycardia and bradycardia. I may have occasion to refer to them next time in connection with prognosis.

LECTURE III.

Mr. Vice-President and Gentlemen,—In this, the concluding lecture of the series, I will attempt to deal with the applications of the facts and considerations which I submitted to you on the two previous occasions when I had the honour to address you. I trust that what I then laid before you proved to be of some interest. Let us see now whether it is practically useful. However much the

etiology and pathology of the diseases and disorders of the heart and arteries in middle and advanced life may deserve study as matters of natural history, we should be disappointed if they could not be turned to account in prognosis and treatment. These are the subjects I propose to discuss this evening.

Now, prognosis and treatment, to be rational and useful, have to be based on as full and as correct a diagnosis as knowledge permits. The present disposition is to fall short of this; to rest content with an incomplete diagnosis. We say that the patient's "heart is dilated," that he has "arterial degeneration," that there is "fatty degeneration." But you will remember that we have found that cardiac dilatation may be present in every kind of cardio-vascular degeneration; that the arteries are naturally enlarged and thickened after middle life, and that we refused to call these changes morbid. Clearly, therefore, a purely anatomical diagnosis of this sort is insufficient. If you are asked what the prognosis is of fatty degeneration of the heart, you answer that you must first be told whether syphilitic or gouty disease of the coronary arteries, or strain, or alcoholism, or phosphorus-poisoning or anæmia is the cause of it. When you are planning the treatment of dilatation of the heart you first determine whether the dilatation is a result of the stretching of a sound heart by overfilling during muscular effort, or of the insufficient emptying of failing chambers with degenerated and feeble walls. Obviously what we ought to determine in these instances and in every instance is the origin of the disease. The ultimate diagnosis to be reached for practical purposes is the etiological diagnosis.

Is this possible? Does our knowledge of the nature, characters and course of these cardio-vascular affections enable us to say, after investigating a case, what the kind of the pathological change is that constitutes the disease, or in what respect the physiological mechanisms are disordered? Can the cause of these degenerations of the heart and arteries be determined in each instance? How is the practitioner to proceed to do so? What method might be followed with advantage in making a complete diagnosis of heart disease in older subjects?

A man of 60 consults us about his heart. He says that it has caused him a good deal of concern lately. More specifically he describes a sense of oppression behind the sternum as often as he exerts himself, and palpitation with consciousness of irregular

cardiac action when he goes to bed. We inquire for other familiar cardiac symptoms, such as pain, angina, fluttering, faintness, giddiness, and a sense of impending death. We find that one or more are present occasionally, and that they have increased in number and degree during the last few months or years. Perhaps cough, nocturnal orthopnœa and dropsy may be beginning to give trouble. The next part of the inquiry relates to the patient's previous history from childhood upwards. Which of the acute diseases has he had? Acute rheumatism, chorea, scarlet fever, typhoid, diphtheria and influenza must be mentioned individually, and in women the nature of any puerperal disease from which they may have suffered. Gout, irregular gout, gravel, eczema, sick headache, asthma must be inquired after with the same minuteness, and so must syphilis. We next hear an account of any accident which the patient may have met with, such as a blow, or a fall from a horse or a carriage. This brings us naturally to question him about his occupation and modes of relaxation and amusements—whether active or sedentary, regular or irregular, their characters otherwise, and their direct effects, including strain. More difficult to elicit is a correct account of the patient's habits—in respect of food, stimulants and tobacco, and his manner of life generally. As I said in my first lecture, this is an inquiry which the family practitioner has an opportunity to carry out much more successfully than the hospital physician or consultant. The family practitioner has known for years of his cardiac patient's work and worries; it may be of his large eating, of his secret drinking, of the history of syphilis in earlier years. It is always well also to inquire after a family history of gout, rheumatism and heart disease. A list of questions like this sounds far more formidable than it is in reality. A few minutes suffice to arrive at the truth. We already have a pretty fair notion what we have to deal with, whether strain, gout, syphilis, tobacco, an old rheumatic lesion, or a combination of two or more of these.

We next proceed to physical examination, beginning with the pulse and arteries, and passing on to the heart and associated structures. The characters of the præcordial impulse—particularly the seat of the apex-beat and the strength of the impulse—are closely (I might almost say laboriously) investigated. We must never yield to the temptation to disregard weakness or absence of the impulse. Like many other negative signs it is apt to be overlooked. Then the præcordial dulness is mapped out by means of

light percussion. Finally, auscultation reveals to us the presence or absence of murmurs and the characters of the sounds—in the standing and recumbent postures, and, if necessary, after a little exertion. The relative loudness of the first and second sounds over the different parts of the præcordia is particularly worthy of note.

Now let us suppose that we have found a mitral systolic murmur. We ask ourselves whether it is structural or whether it is functional, that is, due to relaxation and dilatation of the ventricular walls. If structural, with which (if any) of the diseases elicited in the man's previous history would it correspond? Most probably with gout or glycosuria. Thus we attempt to connect the lesion with its cause, and the cause with its effects, and have reached the ultimate diagnosis. So with other valvular murmurs: for example, an aortic diastolic murmur proves to be related to syphilis. If there be no murmur audible, we naturally think of dilatation with failure, or of enlargement from strain, from Bright's disease, from arterial sclerosis, from emphysema, from an insufficient or impure blood-supply in the coronary arteries, from disordered innervation, or from some rarer cause, such as adherent pericardium; and then, with these associations in our minds, we review once more the patient's history, and generally succeed in our diagnosis.

Here let me recount the significance of the principal signs and symptoms which I detailed to you in my last lecture, considered in the reverse order on this occasion, some of which are of real value in differentiating the causes of cardio-vascular degeneration. To begin with negative facts: a mitral pre-systolic murmur is never significant of a degenerative lesion. Secondly, when we meet with an aortic diastolic murmur, whether alone or along with an aortic systolic murmur, we may safely conclude that we have to deal with something more than atheroma produced by regular or irregular gout and associated metabolic disturbance, cardio-vascular disease of nervous origin and alcoholic or tobacco heart, even if there be evidence of the presence of one or more of these in the case. Aortic incompetence developed in later life is the result of syphilis, or of acute or chronic valvular strain; but, of course, many instances of this lesion met with after the age of 40 can be traced to juvenile endocarditis of rheumatic or other origin. Always a serious lesion, aortic incompetence due to syphilis, or to syphilis and strain, is particularly grave, as being so frequently associated with coronary

disease and consequent myocardial degeneration—fatty or fibroid, acute softening, and sudden fatal failure. A fully-developed basic systolic murmur, audible over the aortic area and manubrium and along the course of the carotid, is a very common sign of atheroma of the aortic arch and valves and great vessels in association with regular or irregular gout, diabetes, corpulence and allied disorders of nutrition. It is also one of the physical signs of syphilitic and traumatic affections of the aorta and aortic valves and of remote endocarditis. Further, these lesions are so often accompanied by similar degenerations in the coronary arteries and consequent myocardial degeneration, that the basic systolic murmur ought at least to raise the suspicion of this in the observer's mind. An ill-developed basic systolic murmur is not uncommon in alcoholism, chronic Bright's disease and nervous strain, but it is difficult to dissociate from anæmia. A fully-developed systolic murmur audible in the mitral area, I mean independently of ventriculo-auricular leakage in cardiac failure, is usually traceable to early endocarditis of rheumatic or other origin, rarely to injury, including ordinary juvenile strain of the valves or walls, or to Graves's disease. But in some instances it is unquestionably due to valvular atheroma and attendant sclerosis, caused by gout or other disturbances of metabolism, including the effects of free living; and in these instances the observer must not overlook the possible association of coronary disease and fatty degeneration. If a systolic mitral murmur prove to be somewhat indefinite and affected by posture, cubitus and effort, to vary under observation from day to day, and to disappear under treatment, it is of no more value to us in differential diagnosis than that it signifies relaxation and weakness, or disorderly action, of the left ventricle, consequent on any one of the recognised causes of failure or disturbance of the heart, including the different cardiac poisons, overwork, anæmia, acute disease, poverty and the like, and this whether in a heart previously sound or previously enlarged or previously the seat of valvular disease. An accentuated ringing second sound in the aortic area, or more extensively, is of great value in the diagnosis of arterial tension and of aortic atheroma or of both, but it is associated with far too many different causes to be of much use in differential diagnosis. It should suggest a most careful search for Bright's disease. Slight reduplication of the first sound is common over the heart strained in youth and the heart degenerated by alcoholism and metabolic disorders, but

everyone knows that it is not unusual in a variety of other conditions, healthy and morbid. On the other hand, the *bruit de galop*, or cantering rhythm of cardiac sounds—definite doubling of the first sound followed by loud, accentuated, ringing second sound—is practically pathognomonic of Bright's disease, and is one of the most valuable, because one of the most ominous, of physical signs in connection with the cardio-vascular system. A normally-sized heart with irregularity, increased frequency, and a variable systolic murmur in the mitral area, is characteristic of tobacco poisoning. A heart enlarged on both sides, and acting irregularly without murmur, is (apart from cardiac failure) suggestive of strain in early life.

Cardiac symptoms taken individually are of less diagnostic value than signs. No symptom is pathognomonic. Palpitation is a nearly universal phenomenon of cardiac disease and disorder. Faintness and actual faints are not uncommon in cases of early cardiac strain, gouty heart, and nervous disturbances. Angina we meet with, you will remember, in regular and irregular gout, tobacco heart, strain (especially strain after 40), and in syphilis and alcoholism, whilst pseudo-angina is extremely common in nervous women : thus angina is of less diagnostic value than might have been expected. A high-tension pulse I have found most often in Bright's disease, in juvenile strain, and in cardio-vascular affections of nervous origin ; a low tension pulse in connection with alcoholic and tobacco poisoning, and with senile strain.

When we review these facts, I think we are entitled to conclude that the physical signs and symptoms carefully determined by clinical investigation may be confidently employed, along with the patient's previous personal history, and the history of his present illness, to differentiate from each other the causes of cardio-vascular degeneration in individual cases. And, further, that they inform us of the seat of at least some of the lesions, valvular, parietal and vascular. A little trouble, patience and attentive observation are all that are required to reach a complete or working diagnosis. Now we may approach the great practical subjects of prognosis and treatment with some confidence.

Prognosis.

Beginning with the simplest kind of cardio-vascular disorder, let us see what the prognosis is in tobacco heart. You will have gathered from what I had to say on this subject in my last lecture, and indeed you know as men of observation and experience, that it is comparatively favourable. All the cases I have had an opportunity to watch did well, provided the cause of their distress was avoided and the heart and vessels were otherwise healthy. Further, improvement begins early, and it may be rapid and recovery complete; but you will remember that one patient, whose case I detailed to you, continued to have alarming angina for six months after giving up tobacco. Recurrence attends resumption of the habit, but some of its votaries contrive to continue to smoke just short of inducing serious discomfort. Unless a successful effort at reform be made, cardiac trouble may continue indefinitely. But even then I cannot say that I have seen serious damage done by tobacco alone in sound hearts, nor arterial sclerosis, as has been stated by some authorities.

An entirely different and most unfavourable estimate is to be formed of the prospect of life in the alcoholic heart. Naturally, a certain proportion of cases recover if the disease be of recent development, the condition uncomplicated, and treatment faithfully carried out. Unfortunately, as a rule, we have to deal with alcoholism in which all these conditions of success are wanting. The habit is established, other organs besides the heart are involved, other diseases than alcoholism are present, and the patient has neither the inclination nor the power to follow our advice. Cirrhosis, neuritis, dementia complicate the cardiac degeneration, or, more correctly, it complicates one or all of these. Chronic Bright's disease is made to account for a number of deaths in the mortality returns that strictly belong to alcoholism. Occasionally the end comes suddenly from fatty degeneration, or in the course of some acute disease; otherwise, as we have seen, by slow cardiac failure and dropsy.

Prognosis in gouty heart, including the heart of the man with goutiness, glycosuria and other irregular forms of the disease, is a subject of considerable practical difficulty. In my last lecture I read to you a short account of the case of a friend of my own who had had occasional attacks of gouty angina for 40 years.

And certainly a large proportion of the old ladies of 60 or 70, whom you all have had as patients for years on end with weak heart and systolic murmur in the aortic area, owe their disablement to gout, if my observations are correct. The lesion proper of the aorta and aortic valves in these cases is atheroma, but the damage is accompanied with repair in the form of sclerosis, which, by increasing the loudness of the bruit, adds unreasonably to our anxiety about the case. Equally certain it is that patients belonging to this class improve under treatment. Still, the condition of arrest cannot go on indefinitely. In addition to extrinsic dangers, particularly those of Bright's disease, cerebral thrombosis and hæmorrhage, and bronchitis, failure of the heart is liable to supervene and prove fatal from the gravest of all intrinsic causes, namely, coronary degeneration. As this increases, the myocardium is steadily more and more impoverished; its contractile vigour declines, and residual dilatation of the chambers sets in with mechanical congestion of the viscera. Complaints of "the heart" increase, the breathing becomes oppressed, the face assumes more and more the characteristic "cardiac" appearance, and dropsy creeps up the lower limbs. Even then the prognosis is not hopeless, for undoubtedly a certain proportion of cases of dropsy in old persons with degenerated heart and vessels are still amenable to rational treatment. But the case has occasionally a more dramatic termination. As I was able to illustrate after my second lecture by a specimen from the Museum of Charing Cross Hospital, a branch of one of the coronary arteries that has been narrowed by atheroma for an indefinite length of time, with consequent cardiac weakness and discomfort, may any moment become thrombosed rapidly, apparently in consequence of some passing depression or other unfavourable influence, just as in thrombosis of degenerated cerebral vessels. Fatal angina is the result. This is a point of great practical importance—that sudden death will occur in old gouty subjects not from the lesion of which a basic or an apical systolic murmur is the evidence and which causes us concern, but from associated coronary atheroma, which we probably never suspect; indeed, that it may occur in those subjects with no murmur whatsoever to attract our attention and excite our fears.

Still more unfavourable must be the forecast in syphilitic lesions of the heart and vessels. Of 18 of my cases in which the result was known, only one-half improved under treatment, and 20 per

cent. of them died within a few years (some indeed within a few weeks) of the discovery of their disease. Cardiac failure accounts for most of the deaths, whether developed gradually with dropsy, which proves to be intractable; or progressing rapidly with great cardiac distress, including angina; or occurring suddenly, as it often does. Aneurysm makes its appearance in other instances, of which the patient dies, or he is carried off by general paralysis or Bright's disease.

What prospect have we to hold out to the man who has strained the walls of his heart by muscular effort? I believe that one can speak with some confidence on this subject. The middle-aged patient who over-stretched his cardiac walls as a youth may be comforted with the opinion that the condition is not a fatal one. The average duration of 11 cases of this order I found to have been 30 years when they came under my observation; the minimum duration was nine years, the maximum 50 years. This last case deserves particular mention. The patient was first seen by me for failure of the heart with cardiac dropsy, consequent on fresh breakdown after exertion during a holiday; and it is most encouraging to observe that compensation was restored by treatment, and that now, 12 months after that event, he is not only alive, but able to carry on light professional work. This case also illustrates what I have told you respecting the course of the affection, and the prospect before the patients, in long-standing strain—that there is continual liability to fresh embarrassment of the heart during exertion, in which they appear to have a lasting inclination to indulge. If they happen to follow an occupation that entails occasional effort, or effort with excitement and worry (if they happen, let us say, to be busy practitioners of medicine), they suffer in the same way from attacks of tachycardia, distressing palpitation and anxiety. Indeed, as I pointed out in my second lecture, they are readily upset by other influences besides these, including indigestion, to which the victim of hurry and worry is peculiarly liable; and they must be prepared to have to lead a life of comparative temperance and self-denial.

Neither is strain of the heart for the first time after 40 by any means so grave as might be expected. Of course, sudden muscular effort occasionally accounts for sudden death in old men. But it is astonishing how, under such circumstances, quite old persons do recover from conditions of extreme distress lasting acutely for half

an hour—for instance, after running with a heavy bag to catch a train. The majority of my patients described their condition as improved after a time, but others relapsed; and on the whole the correct prognosis is that they must expect to remain variously disabled—that is, liable to præcordial distress and dyspnœa on more than moderate exertion, or when subjected to circumstances of other kinds that tax the heart.

Cardio-vascular disorder and disease referable to nervous strain pure and simple is amenable to treatment by complete and prolonged rest or relaxation in the majority of instances. Still, death may occur from sudden cardiac failure; or should advice be neglected or soon forgotten, as happens so frequently in these subjects, the attendant high arterial tension and vascular degeneration too often end in cerebral lesions, with or without Bright's disease. Of chronic Bright's disease itself and the associated cardio-vascular changes in their prognostic aspects I need not speak, except to say that along with syphilis it is by far the most hopeless of all these affections.

In attempting to forecast the life of a man who is the subject of cardio-vascular degeneration in middle or advanced life, we must not forget the possibility of the intercurrence of acute disease. Here is a large subject for us as practical men—one far too large and important for discussion here: the effect, for instance, of the existence of enlargement of the heart and an irregular and thickened pulse on the prognosis of influenza, or, let us say, on the chances of a successful issue after operation. Very naturally, unsound vessels and a murmur over the præcordia weigh heavily against the prospect of recovery from pneumonia, for example; and yet how often do we not find a patient of 70 with one or both of these disturbing conditions come safely through such an illness! Here, again, I believe it is in great measure the true nature of the old-standing disease, not the physical signs such as irregularity of pulse or mitral bruit, that ought to be taken into account. A heart enlarged and a radial artery thickened by prolonged activity and nothing else will suffice to carry a man safely through an attack of influenzal pneumonia; but what chance is there for the chronic alcoholic under similar circumstances, or for the subject of chronic Bright's disease?

So much for the general prognosis in each of these kinds of cardio-vascular disorder and disease. But it is the particular prognosis that we have to attempt to estimate—that is, the

prognosis in the individual patient as he comes before us and asks us that trying question, "What is my prospect of life and health"? We diagnose, if possible, the precise nature of his cardiac affection, and apply to the best of our ability the conclusions which I have just submitted to you, and at the same time we estimate as correctly as possible the man's personal condition, character and disposition. For, whatever may be determined with respect to the average patient by an analysis of a large number of these cases, the individual patient's future in disease of the heart of every kind, degenerations included, greatly depends on the care that he takes of himself. This introduces us to another consideration. However earnestly we may attempt to estimate the prognosis on a strictly rational system—that is, by basing it on an accurate and complete diagnosis—we cannot deny that when the individual patient is before us we are influenced directly by certain of the symptoms and signs, without asking ourselves what their respective pathological meaning may be. True bradycardia, the story of an unmistakable attack of angina pectoris, a loud aortic diastolic murmur, the *bruit de galop*—these instantly give us great concern before we have had time to translate them into the language of morbid anatomy. Very naturally we attempt to carry this method too far, and to reach a prognosis, as it were, by a short cut, by attaching a prognostic value to each clinical phenomenon—palpitation, præcordial oppression, faintness, lethal sensations, and so on. Now, quite irrespective of the unscientific character of this proceeding, it is of little practical service. Even when we have listened to an account from a middle-aged man of an attack of angina pectoris, what can we tell him of his prospect of life until we have learned whether he be guilty of excessive smoking or drinking, whether he be gouty, whether he have lately strained his heart or no? What I do regard as really valuable prognostically, in the way of a simple clinical observation, is the determination of progressive symptoms and signs. A man of 72 complains of oppression over the lower sternal region as often as he climbs a hill. Twelve months later he comes and tells us that he has had an attack of severe pain across the top of the chest during the night. Another year passes, and he returns to say that now he cannot hasten on the street without præcordial distress; and it is noted that the second aortic sound, previously thick in character, is slightly blowing. By the fourth year of observation the patient, having had influenza in the interval, complains of an

auto-audible murmur, and of actual pain in the chest; there is now a fully-developed aortic diastolic murmur, and his ankles swell occasionally. Prognosis was only too easy in this case, without inquiry into either the cause or the lesion. A few months later true angina occurred, and very shortly the patient died, after twenty-four hours' severe suffering.

Treatment.

Not the least advantage of the etiological standpoint of our survey of the disorders and diseases of the heart and arteries in middle and advanced life is the rational as well as hopeful line of treatment which it enables us to pursue. On the whole, we can control morbific influences more easily than we can alter pathological processes; and (what is of equal or even greater importance) a knowledge of the causes of disease often enables us to prevent what we could not possibly cure. For all that, the etiology of heart disease furnishes us with but one set of many invaluable indications for treatment. We must have also a clear mental picture of the pathological anatomy of the conditions we would attempt to modify —for instance, of the damage wrought by gout on the mitral valves and aortic arch, by syphilis on the coronary arteries, by strain on the walls of the different cardiac chambers. No less necessary is it for the practitioner to take into account, before proceeding to prescribe, the clinical characters and course of the case in hand. As I have said more than once already, a large proportion of the distress, disabilities and dangers attending degeneration of the heart are due to some additional or extrinsic disturbance—distension of the stomach, constipation, worry or exertion—which alone, not the pathological condition, calls for therapeutical attention.

It appears, then, that the whole natural history of the diseases and disorders of the heart—and, I might add, of every individual case—has to be studied, and the value of its different parts absolutely and relatively estimated, before rational treatment can be ordered. How different will treatment be, if ordered on these principles, from the routine procedure of prescribing a little strychnine and digitalis for a man with oppression on exertion and a systolic bruit at the base of his heart!

Let us begin this part of our subject with a brief consideration of preventive treatment, founded on a knowledge of the cause at work.

Now, the first thing to strike us about these unfavourable influences is the number of them that could be avoided or controlled successfully by simple exercise of the will. The toxic effects of tobacco, alcohol, tea, &c. are due to abuse, from thoughtlessness or ignorance, or from indisposition rather than inability to exercise self-control. The abuse of tobacco appears to create so much discomfort or even alarm, of a kind which the sufferer cannot fail to refer to its cause, that the remedy is effected automatically, and no great harm is done. We seldom have to do more than confirm the patient's suspicions in this direction, and recommend temporary abstinence from the cigarette or pipe and greater care in the future. With alcohol it is a different matter. Alcoholism grows by what it feeds on, and our best efforts are often vain. The present is hardly an occasion for dwelling on this subject—the duty of the profession to their patients and friends in respect of the abuse of alcohol. Still, I should not feel that I had discharged to the best of my ability, or in full conformity with my strong convictions, the duties of the honourable position which by your favour I occupy as Lettsomian Lecturer, if I did not urge you to exercise more fully than is at present exercised your personal influence to discourage habitual drinking. I believe (because I have found) that many men who are not open to arguments of an abstract kind, can be made to pause and reconsider their manner of living by having a concrete presentment of their condition and its results placed before them—in plain English, by being thoroughly frightened. "Heart disease" is a powerful argument to employ with persons of this class, and it is one that is also justified by the issues at stake. Of syphilis and the havoc that it works on heart, aorta and the vascular system generally, but particularly within the nervous system, I need not speak. The profession, as I have said, is not yet sufficiently alive to it: what can the public be expected to do in the way of prevention? Gout, corpulence and allied metabolic disorders, those fruitful sources of cardio-vascular disorders and atheroma, call for temperance not only in drinking but in eating. Whilst the question continues to be discussed which particular articles of food ought to be avoided by gouty individuals, let us all join in offering them one bit of advice of the value of which there can be no doubt: whatever they eat, to eat little. Moderation in amount is, speaking broadly, far more important than avoidance of the theoretical antecedents of uric acid, whether meat, or milk,

or sugar. Let me quote what Dr. George Balfour, who has written so much and so well on disease of the heart and its treatment, says on this subject:—"I know of no society that inculcates, by precept or example, temperance in regard to food; yet there is nothing ages a man or a woman so rapidly, there is nothing that shortens life so certainly, and there is nothing that embitters the latter days of life so much as over-indulgence in food. To those who can afford thus to transgress—to the well-to-do—excess in food is a much more serious menace to health and life than excess in drink, and it is specially so in respect of senile affections of the heart, some of which have been distinctly recognised to owe their origin to over-indulgence, while all are distinctly aggravated by it."* With the observance of this simple and wholesome dietetic rule must go attention to free elimination by all the excretory channels, and the insurance of sufficient exercise and enjoyment of fresh air. If we wish to impress this consideration on our own minds and give effect to it in our practice, let us call to mind for a moment the number of cases that I have submitted to you of atheroma of the aorta in stout matronly women of sedentary and luxurious habits, in whom, indeed, this degeneration is quite as common as in men.

I have already said so much on the subject of cardiac strain that it is unnecessary and would be uninteresting to return to the question of the prevention of it. We have seen how often it occurs in the middle-aged or old subject by ill-considered attempts at athleticism. Moderation and due respect for age are the true guides to the useful enjoyment of exercise after 40. As for the evil effects of nervous influences on the circulation, in addition to anxiety, care, misfortune and grief, which are usually beyond our control, nervous strain, as distinguished from simple hard intellectual work, often must be relaxed if cardio-vascular damage is to be prevented. I refer to the cases of persons in positions of great responsibility with heavy complex prolonged duties, which they fail to overtake without exhaustion consequent on high pressure and excitement.

I would not have dwelt so long upon the measures calculated to prevent degeneration of the heart, were it not that they have to be employed with equal strictness and perseverance in the treatment of

* G. W. Balfour, 'The Senile Heart,' p. 236, 1894.

cardio-vascular disease when it is already established and our assistance is sought with anxiety. The etiological indications have still to be respected faithfully; on this I need not dwell. The next question is:—What can be done for the pathological changes wrought on the arteries and the valves and walls of the heart? In syphilitic lesions we do not hesitate to say that potassium iodide should be given freely: it is a specific remedy of great value. Can the atheromatous process be influenced with equal or with any success? It depends on toxæmia and anæmia; the obvious indication is to purify and enrich the blood. This, at least in respect of gout, glycosuria and corpulence, as we have just seen, must be effected by a thorough reform in every department of personal hygiene. Arsenic and moderate doses of iodides, combined with an excess of alkalis, are calculated to promote the same end. Dr. Mott has shown that atheroma, whether of valves or of vessels, can be traced in many instances to disease of the *vasa cordis* and *vasa vasorum*. This carries us a step forward in our quest for indications, but the practical conclusion remains—that the healthy nutrition of the smaller arteries has to be restored by attention to the blood and the use of specific remedies.

So much for valvular and vascular lesions. There remains to be discussed the fulfilment of the greater indication for treatment: the one which directs and governs the employment of the most important and successful of all the measures comprised in cardiac therapeutics. This is the establishment and maintenance of compensation. The nutrition and activity of the myocardium can be increased and sustained by means of specific cardiac stimulants and tonics, such as strychnine, ammonia and the digitalis group of drugs; by hæmatinics, stomachics and laxatives to afford an abundant supply of healthy blood; by insuring wholesome nervous influences, one of the conditions of hypertrophy; and by the employment of the non-medicinal measures now so extensively used to increase the vigour and benefit the metabolism of the cardiac walls, particularly active and passive exercises and baths. This is a comprehensive statement of the lines of treatment calculated to benefit more or less all the kinds of cardiac degeneration which I have had occasion to notice. Of the individual pathological changes, and the rational treatment indicated for each from this point of view, I will refer to three only which will serve to illustrate the considerations which ought to guide us in practice.

In the subject of regular or irregular gout attention to the cause, that is, to disordered metabolism of the body as a whole and of the cardiac and arterial walls in particular, promotes, as we have seen, the recognised conditions of compensation: the etiological and pathological indications are here practically identical. In respect of exercise in detail, gentle walking on the level should be ordered to begin with, that is, exercise short of producing pain or oppression. The patient had better give up his regular work for a time, and take advantage as fully as possible of the leisure to enjoy the benefits of a healthy life in the fresh open air. Very shortly he will be able to ride, play golf, shoot and cycle slowly. A course of treatment at one of the best of our native spas or of the Continental watering-places sometimes makes a new man of the sufferer from gouty heart. The Nauheim treatment, whether taken there or in England, may also do real good. But it must not be employed indiscriminately, as is so often done. The profession ought to remember (what the public cannot and probably never will come to understand) that pathological diagnosis must precede rational treatment, which consists in applying a proper remedy to the individual case before us, not in fitting every case to a specialised system or panacea—the essence of quackery.

In planning the treatment of the dilated heart of the middle-aged man who strained his circulation in youth and comes to us complaining of a recurrence of præcordial distress and breathlessness, we have to remember that there is left in the cardiac walls but a portion of that reserve of elasticity and that reserve of muscular energy which they normally possess and require to enable them to meet the stress of exertion. Let me remind you for a moment that, of the provisions which the heart possesses against such an emergency or other sudden or severe demand upon its capacity and activity, one is extensibility of its tissues, by virtue of which it accommodates within it the considerable increase in the charge of blood that is poured into it from the active muscles, and the residues that accumulate within it from insufficient discharge in the face of increased peripheral resistance. The walls yield before the increased internal pressure acting on them both *a tergo* and *a fronte*; the heart is overdistended, with a passing sense of discomfort, dyspnœa and lividity; and when the muscular effort is ended the elasticity corresponding with extensibility of the walls presently insures the return of the chambers to their original dimensions. At the same time a second

provision comes into operation. Increased muscular activity is developed in accurate proportion to the rise of internal pressure and secures sufficient output from the heart. This, I repeat, is what occurs in the sound heart. Now, in old parietal strain extensibility and the reserve of capacity of the chambers which it insures are seriously exhausted; whilst the muscular function is only maintained by means of hypertrophy, to which there is necessarily a limit. In these cases of strain it is impossible to reduce the original dilatation —that is permanent. But we may and ought to be able to reduce the further dilatation, if any, that has been produced in connection with recent failure of nutrition and fresh embarrassment. Therefore, whilst we promote the nutrition of the elastic and muscular structures of the myocardium on the general principles which I have just laid down, we must be distinctly sparing of our demands on them. Everything approaching effort must be forbidden at once and for a sufficient time to rest and reinvigorate the cardiac tissues; whilst the nitrites or small doses of opium will also give relief and restore confidence in attacks of palpitation and anxiety. "Exercise, but not exertion," will be the broad rule to follow, at any rate until it has been proved that greater effort can be made with safety and actual advantage. But if præcordial embarrassment be the result of the attempt, or of ordinary professional work, as occasionally happens, further rest will have to be taken, that is, rest for hours or days, according to the severity of the symptoms. I have already mentioned to you that middle-aged patients with cardiac strain, dating from their youth, occasionally break down in their work for months or even years. In such an event a thorough change of air and scene should be combined with rest as a method of treatment. A long voyage may prove invaluable, or foreign travel of an easy and interesting kind. These not only rest the heart, but they divert the mind and remove the curious nervousness or loss of courage which, as I have said, is developed occasionally in these subjects, previously so vigorous and confident.

Compare with this line of treatment that which is indicated in acute cardiac strain after 40. The problem here is not how to deal with a chronically dilated and hypertrophied heart, but with a heart which has just yielded during effort, mainly in consequence of the nutritional impairment of its walls. It is not simply strain of a heart that had begun to be somewhat precariously nourished as a natural result of age; the probability is that the heart was actually

gouty in the comprehensive sense of the term, that is, irritated by uric acid and embarrassed by flatulence, both mechanically and reflexly; and, indeed, possibly it was damaged by the atheromatous process. Rest is essential at first in the treatment of this type of case also; indeed, it is automatically secured by the distress which accompanies attempts at movement. But rest must not be carried too far, that is, it must not be of greater degree or duration than is absolutely necessary as indicated by the symptoms and signs, lest it aggravate the state of parietal mal-nutrition and promote fresh gout. At the same time the diet must be controlled strictly or even severely on the lines that I laid down for gout, lest the over-feeding which accompanies rest as a matter of thoughtless routine should have the same unfortunate effects. A course of treatment at some of the good home or Continental spas, with special precautions, is distinctly useful in senile strain, and the Nauheim methods have benefited more than one case of the kind in my experience, the degree of dilatation diminishing whilst the vigour of the heart increased. At the same time cardiac tonics of a medicinal kind are administered judiciously.

I am on the point of passing from the subject of the nutrition of the myocardium, when it occurs to me that some of you might very naturally ask me: What about fatty degeneration and the treatment of it? This is a question peculiarly interesting to me. I have not dwelt on fatty degeneration of the heart in these lectures, and yet I have mentioned it again and again. I have said that it is a result of alcoholism, of gouty atheroma of the coronaries, of syphilitic arteritis in the same area, of Bright's disease, of profound anæmia and of phosphorus poisoning; and that I believe it may result from severe nervous strain of a harassing and depressing character; and that in connection with each of these causes it has to be regarded and treated differently. Nothing could well bring home more fully to us the importance, indeed the necessity, of pursuing in practice the line of inquiry, prognosis and treatment which I have advocated in these lectures—the etiological one. Let me ask you also to listen to a confession of one of the highest authorities on heart disease in this country. "It is absolutely impossible," says Dr. George Balfour, "to diagnosticate fatty degeneration of the heart; we may surmise its existence, but we can only be certain of its presence when we see it *post mortem*"; and he quotes Fraentzel of Berlin in support of his

statement.* It must have occurred to many of you, as it has occurred to me, how seldom we diagnose fatty degeneration of the heart until after sudden death. How can we be expected to do so if we trust only to signs and symptoms, and overlook that which is the key to the diagnosis—the discovery of the cause that is at work?

I have now sketched very broadly the rational treatment of these disorders and diseases as far as the object of it is to prevent the occurrence or the extension of them, and to promote compensation of the disabilities which they produce. It remains for me to notice, also very briefly, the management of cardio-vascular degenerations when the heart fails, or when it appears to fail, and distress and danger demand more direct and immediate attention. I have said "when the heart appears to fail" of set purpose. I am anxious to direct your attention, if it be but for a moment, to the fact that in many instances where præcordial oppression, pain, palpitation and faintness, with frequent small irregular pulse, are significant of serious disturbance of the action of the heart, there is no failure of the myocardium in the proper sense of the term, but only embarrassment of a temporary character. Do not conclude from this that I regard the disturbance of the heart as of little account. I have called it serious, for indeed the patient may perish of it. What I wish to maintain is that in cardiac degeneration of any kind, in chronic cardiac dilatation, and in the enlarged heart of Bright's disease and of emphysema, just as in ordinary valvular disease, attacks of distress, alarming both to patient and doctor, often occur which call for nothing more in the way of treatment than attention to some intercurrent influence—an indigestible meal, loaded bowels, a nervous shock, a thoughtless effort, a passing hardship or nervous strain. Digitalis and its allies, strychnine, alcohol, nitrites, iodides and the rest are out of place in such an event. Complete rest in bed, a carminative draught, calomel and saline purgatives, spare and highly digestible diet, reassurance and a little time are quite sufficient means of treatment.

When true failure occurs, manifested by the familiar phenomena of residual dilatation of the heart, mechanical congestion and dropsy, a different set of measures are demanded. Now is the time to attend with expedition, energy and completeness to the fulfilment

* Balfour, *op. cit.*, p. 249.

of the three great therapeutical indications for the treatment of cardiac failure: to reduce the peripheral resistance; to increase the vigour of ventricular contraction and rehabilitate hypertrophy; and to remove arrears of work in the form of residual blood in the cardiac chambers, mechanical congestion of the veins and viscera, and dropsy of the integuments and serous sacs. Bodily rest; a light, solid diet, and a definite allowance of alcohol, if required; active purgation with mercurials, salines and jalap; and the exhibition of sufficiently large doses of digitalis or one of its congeners, in combination with saline and other diuretics—these are the means calculated to attain the desired objects. You will not expect me to enter into the many details of the management of cardiac failure. It is not different in any important respect in the man of middle or advanced age with cardiac degeneration from what it is in an ordinary case of chronic valvular disease. Only on a few points do I desire to dwell. First, that we must not be afraid to purge these patients, if necessary, every morning. Secondly, that when the appetite flags and flatulence occurs, instead of slops a blue pill or a dose of calomel should be given, and light solids persevered with. Third, that digitalis must be given freely, the dose of the tincture, for instance, being raised to 15 or even 20 minims every four hours, if smaller doses, such as $7\frac{1}{2}$ or 10 minims, fail. Unquestionably there is a disposition on the part of some practitioners to pause or retrace their steps in the dosage of this invaluable drug, alarmed by the irregularity, frequency and smallness of the pulse. All these characters of the pulse call for more digitalis, not for less. In this connection let me also say that the most ready and accurate, because measurable, evidence of the action of digitalis in cardiac failure is strangely disregarded in ordinary practice—I mean the volume of the renal secretion. We may be in difficulty, and we may differ with each other, as to the tension of the patient's pulse and the use of continuing or modifying the digitalis treatment, when all that we have to do is to ascertain the exact degree of diuresis. Fourth, that nocturnal restlessness and sleeplessness are to be met unhesitatingly with permission to spend the night in an easy chair by the bedside. Fifth, that, according to my experience, acupuncture and drainage succeed perfectly in these senile cases with dropsy, as much as 10 pints or more of serum escaping in the course of 24 hours, to the complete and often lasting relief of the circulation.

And now I must bring these lectures to a close. In doing so I feel that I have not only to thank you, Sir, and the Fellows of the Medical Society and our visitors for the favour with which I have been received and the patience with which you have listened to me, but at the same time to apologise for the many defects, both in matter and in form, of what I have presented to you. It is a fortunate circumstance for me that, whilst the subject was so large and so difficult, the mode of treatment of it commonly associated with the Lettsomian Lectures and your kind forbearance have enabled me to conceal my shortcomings by free selection of less severely scientific topics, and the employment of an easy style. At the same time, may I claim a little of your favourable consideration for the aspect in which I have regarded the disorders and diseases of the heart and arteries in middle and advanced life? I should be satisfied with the results of my efforts on this occasion, whatever may be thought of their form, if I have succeeded in convincing you of the practical advantage of regarding these complaints from the side of their causes as well as of their pathological anatomy.

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