An Address ON CARDIO-VASCULAR SYPHILIS IN GENERAL PRACTICE.*

BY
CAREY F. COOMBS, M.D., F.R.C.P.,
PHYSICIAN, AND IN CHARGE OF UNIVERSITY CENTRE OF CARDIAC
RESEARCH, BRISTOL GENERAL HOSPITAL; PRESIDENT,
BATH AND BRISTOL BRANCH, B.M.A.

THIRTY years ago—when I was a student—we were just beginning to realize the essential nature of the relation between syphilis and tabes; no syphilis, no tabes. And in my early out-patient days the art of skiagraphy, which has added so much to our knowledge of these lesions, was only just beginning to be applied freely to the diagnosis of aneurysm. Again, it was approximately at the same time, about 1907, that Schaudinn first published an account of the *Spirochaeta pallida*. This gave a tremendous impetus to the study of syphilis. Within the next two or three years we acquired a new diagnostic weapon in the Wassermann test, and added salvarsan to our therapeutic resources.

It is not surprising, therefore, that our views as to the frequency of syphilitic injury to the heart should have changed in this period. Formerly thought to be a rare lesion, it is now known to be one of the most inevitable results of the infection. This change is due partly to a more accurate understanding of the nature of cardio-vascular syphilis. In those early days we thought of it in terms of gummata: now we think of it in terms of aortitis. Recent experiences in the histology of cardiac syphilis have convinced me that in this change of view we have come nearer to the truth. In the course of a study of cardiac infections I have lately cut sections from a series of fifteen syphilitic hearts. Aortitis was seen in every case, while only once did I find a gumma, and that was a microscopical one.

PATHOLOGY.

For more than one reason it seems clear that we ought to rank these lesions with those of tabes and general paralysis. They fall into the same epoch, a stage of the syphilitic process, that is, about twenty years after the primary infection. During that period, in the vascular as in the nervous system, there is no evidence of disease. When symptoms do appear they increase so rapidly as to suggest that lesions have been developing for years without any great disturbance of function, and this impression is confirmed by histological inquiry. Both aortitis and tabes, then, develop in the same way and reach maturity at the same period. Moreover, they occur in the same kind of person, in the middle-aged man, and, in fact, often coincide in the same patient, producing the Babinski syndrome more or less full-blown. Then, again, there are histological similarities; both sets of lesions appear to arise in the lymphatic system and to end in a kind of starvation of the special cells of the part concerned rather than in a direct poisoning of those cells themselves.

So far as the cardio-aortic pump is concerned, the most constant lesion is aortitis. Sections of the aortic wall show that this inflammatory process spreads from without inwards. (See diagram.) Infiltrating

the peri-aortic connective tissue, masses of cells, mostly lymphocytes, fill the lymph channels and pile up in a dense layer lining the outer aspect of the aortic wall. Through this layer the vasa vasorum pass on their way into the aortic media, and at this point they are surrounded by the lymphocytes. The walls of these small vessels swell so much that their channels are almost closed. More striking still, however, is the investment of lymphocytes, which clings to them as they penetrate into the aortic media. The result is that in the media large collections of lymphocytes can be seen which spread along planes between the laminae of elastic tissue. Later, these laminae break down, and large spaces form within the aortic wall, which are filled with inflammatory cells. These spaces perpetrate widespread breaches of the medial elastic, and it is not astonishing that aneurysms are apt to form. At the corresponding part of the aortic wall the intima becomes thickened as if attempting to form a kind of buttress or emergency dam at the weak point in the wall.

Even if there were nothing else, this breach in the continuity of the medial elastic is a serious business. It means that the circulation is deprived of part, at least, of that aortic recoil which constitutes one of the chief agencies forwarding blood to the periphery. The risk of aneurysm is, of course, not to be forgotten, but this is occasional, whereas the loss of elasticity is invariable. It must involve an increase in the work which the left ventricle is called upon to do. Even if syphilis did nothing worse than this, it would rank high as a cause of cardiac failure.

But it does much more. The inflammatory tide, which we have described as breaking against the outer aspect of the aortic tube, spreads along it towards the heart, being checked at the root of the aorta owing to the disposition of the lymph channels. Yet the fact that it is, so to speak, held up here causes that inflammatory wave to spend itself with particular force on two structures that lie at this level—namely, the mouths of the coronary arteries, and the commissural attachments of the aortic semilunar cusps. The coronary orifices are nipped in a tightening grasp, the result being starvation of the muscle which they supply, with replacement fibrosis and degeneration of the myocardial fibres. Thus the ventricle is compelled to work harder, while starved of its proper nourishment. Further, the aortic cusps, infiltrated at their commissural ends, become stiffened, and adhere to one another and to the adjacent aorta, thus becoming incompetent. Sometimes also they perforate near their bases. About two-thirds of the patients who suffer from cardiac syphilis display signs of aortic regurgitation. It is true that there are parts of the heart that are spared: the right heart is rarely attacked, the mitral valve never. Yet the syphilitic process achieves such a concerted attack on the cardiac functions as to set in motion a whole series of vicious circles and to bring about a failure, which moves with ever-increasing velocity to the final catastrophe.

This is, in general, what we are to expect from the examination of a syphilitic heart. There are, of course, additions, as there are exceptions. The coronary vessels, or the aortic cusps, or both, may be spared. On the other hand, gummata may be added to the changes which have been detailed. On the whole, however, we should think of cardio-aortic syphilis as conforming to the pattern which I have described, and as coinciding in time and in other respects with the taboparalytic phase. Aortitis is, in fact,

Diagram of the base of the aorta. The syphilitic process is shown surrounding the aorta and the coronary orifices, and penetrating the media of the aorta and the bases of the aortic cusps.

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a parasymphilitic lesion, and owes its existence to the survival in the body of spirochaetes which have resisted treatment.

CLINICAL ASPECTS.

Now, since these lesions do not declare themselves by symptoms till approximately twenty years after the primary infection, it follows that we ought to be on the look out for a large number of cases during the forthcoming decade; for it was during and immediately after the war that the incidence of syphilitic infection greatly increased. It is true that during that period, and since, the treatment of syphilis has been more active and thorough than ever before. Nevertheless, the possibility of this increase in the incidence of cardio-vascular syphilis is partly responsible for the choice of my subject. A calculation based on an analysis of 2,089 cases of organic disease of the heart and blood vessels indicates that at the present time syphilis is the cause, in Bristol at all events, of about 5 per cent. of the cases. If autopsy data are taken, the incidence is even higher—about 8 per cent., according to Dr. Taylor's General Hospital figures. Already, then, it is a not unimportant source of cardio-vascular disease.

Discussion of Signs.

A majority of the patients whom I have seen have sought advice on account of cardiac symptoms. In a few instances some other effect of syphilitic infection, upon the nervous or other organs, has brought the patient under a general examination, and a cardiac lesion has been found. The usual course of events is a complaint of dyspnoea, or of precordial pain, or of both, by a man in middle life, who is found on examination to show signs of aortic regurgitation. Even in these straightforward cases there are several aspects that deserve some consideration.

The pain complained of is of the cardiac type, being substernal, gripping in character, and aggravated by exertion. It is, however, often distributed over unusual areas, such as the front of the right shoulder, and it has a way of arising spontaneously, and without any provocative exertion; that is not so common a feature of the other pain-producing lesions of the heart. Then, again, one has to be ready to recognize aortic leakage on little evidence. It is true that the signs, once established, tend to increase steadily, and that the diagnosis is therefore soon declared. One small point to be remembered in this connexion is that it is worth while listening for the basal diastolic murmur with the patient in all sorts of positions. It may, for example, become audible when he sits in a chair and leans forward. Dr. Herapath tells me that the use of a wooden stethoscope enables one to hear aortic diastolic murmurs that would otherwise escape detection.

Another point which I think receives too little attention is the extreme, and often decisive, value of blood pressure readings. This is particularly true of the aortic incompetence that results from syphilis, which is so rapidly progressive that free leakage may be encountered even before there has been time for a corresponding increase of the ventricular mass. I need hardly add that the significant change is an increase in the pulse pressure. This is sometimes caused partly by increase of the systolic pressure, sometimes by a fall of the diastolic pressure, sometimes by both. More often it is a downward movement of the diastolic figure, which may fall so low as to be unmeasurable by the auscultatory method. In such cases one finds that as the air escapes from the armlet, the critical moment at which the loud arterial sound is replaced by a softer one is not reached at all, or is reached so gradually as to make a definition of its precise level impossible. When these phenomena are encountered, they are to be construed as evidence of a very free leakage.

In making a full diagnosis of cardio-aortic syphilis, as of any other visceral lesion, our object must be to visualize the anatomical and physiological disturbance as a whole. We must therefore compel ourselves to recollect that the disease which has thus injured the aortic valves has also, in all probability, inflicted damage on the wall of the aorta and narrowed the coronary arteries at their mouths. The damage to the aortic wall may be roughly assessed by dividing the cases into those in which there are no direct evidences of aortitis, those displaying signs of general aortic dilatation, and those with a saccular aneurysm.

In mentioning a group in which no signs whatever are found, I have in mind some in which even a careful x-ray examination failed to show any widening of the aorta. It is difficult to understand how this can occur, yet experience proves that it may. A considerable proportion of all cases is included in the second group. The physical signs are not very obvious as a rule. In many there is no more than an accentuation of the aortic second sound, but this is highly significant in the appropriate context, especially in the presence of a normal or low blood pressure. To this may be added an increase in the aortic dullness, which may reveal itself on either side or on both sides of the manubrium. It is also worth while to percuss down the sternum. Ordinarily this should fail to encounter dullness, but if the aorta is enlarged the percussion note is decreased over the upper part of the sternum.

The physical signs of aneurysm are so numerous and so well known that there is no need to describe them here. Perhaps two comments may be worth while. The first is that one should differentiate as clearly as possible between saccular aneurysm and general dilatation of the aorta, since there is so wide a difference between the prognosis and the treatment of the two conditions. It is true that they are merely different stages of the same process, but the simple dilatation is important chiefly because of its implications in regard to circulatory inefficiency, while the aneurysmal sac behaves like a dangerous intrathoracic tumour. My other comment applies both to the aneurysm and to the general dilatation. Although examination with the x-ray screen is always helpful, we should practise the art of diagnosis by ordinary physical examination, since it is almost certain that in a majority of cases we shall have to make the first tentative diagnosis without depending on x rays.

It is even more certain that ordinary clinical examination must be relied on to furnish a basis on which to form an estimate of the amount of myocardial inadequacy in any given case of cardiac syphilis. Here one must be prepared to accept hints, and not to expect these to be too plain.

For example, a woman, aged 51, seen on the day on which these notes were written, gave a history of repeated miscarriage and of a fortnight's precordial pain arising independently of exertion, and spreading through the left arm to the finger-tips. She was seen to be a little breathless on slight exertion, such as sitting up in bed for examination, and the lips were bluish. Physical examination disclosed no explanation of the phenomena other than a myocardial one, and there was little but a reduplication of the first sound of the heart over the area of ventricular impulse, an ominous sign of myocardial impairment.

There is the more need for care in looking for such evidence, since the electrocardiographic method is not only difficult of access, but apt, in these cases at all events, to be equivocal in its results. Gross changes of rhythm are not very common in cardiac syphilis. Heart-block was noted in three of my 103 cases, total arrhythmia in eight, and auricular flutter in two, with a possible third. The injury which syphilis does to the myocardium is a diffuse injury, since it is at the mouths of the coronaries, and there alone, that the blood supply of the cardiac muscle is cut down. Hence all parts of the cardiac wall suffer equally so far as this process of starvation is concerned; but as it is on the left ventricle that the brunt of the extra work caused by the aortic lesions falls, it is natural that the form of failure common in cardiac syphilis should be that which is described as ventricular. This is manifested by symptoms rather than signs. Yet there are two or three signs whose value can scarcely be exaggerated. First, there is weakening and diffusion of the impulse, and with it a corresponding weakness of the cardiac sounds. In these, again, a cantering rhythm or *bruit de galop* is often heard, and may indicate serious ventricular weakness. The sphygmomanometer may also supply valuable data. By its use we are able to detect alternations of the pulse too slight to be felt at the wrist or recorded on a pulse tracing. Then there is the highly significant shrinking of the pulse pressure gap, which is so valuable an index of decreasing ventricular output.

This discussion of signs may now be summed up in a few words. To those which indicate aortic regurgitation we are to add, if we can find them, evidences of

aortic enlargement, and also of myocardial inefficiency. When this has been done, a mental picture of the extent and distribution of the lesion can be formed.

The next question that we have to ask ourselves in any given case is: What proof have we that this lesion is syphilitic? The answer is derived from four sources.

1. There is the pattern of the disease itself. Aortic incompetence in middle life; precordial pain on slight exertion; dilatation of the aorta—these are patterns which are likely to be syphilitic. Others, such as mitral stenosis with auricular fibrillation, are almost certainly not syphilitic.

2. There is the patient's history. I think we lose a good deal of valuable help because we neglect to make this inquiry, relying instead on a Wassermann test.

3. There is the collateral evidence furnished by signs of syphilis in other organs. One or two examples will make this clear.

A man admitted for aortic regurgitation was found to have a lump embedded in the right lobe of his liver. This disappeared under treatment with potassium iodide. In another instance a patient with a cerebral thrombosis and cardiac hypertrophy with high arterial tension showed a characteristic glossitis, and again the use of potassium iodide strikingly accelerated his recovery.

A third case was that of a man with an aortic leak. As we were on our way to the house I asked the doctor whether blood ought to be taken for a Wassermann test, and he said that a glance at the patient's daughter would do more towards clinching the diagnosis. In this man also I found an Argyll Robertson pupil.

4. There is the Wassermann test. There are one or two reasons why this comes last. It is not absolutely infallible; sometimes it is impossible to get a specimen of blood; and by relying on this test alone we may lose a good deal of valuable information which would otherwise be obtained.

I wish I could add to these four criteria a fifth—namely, the response to treatment. We all know how often this proves itself reliable in some forms of late syphilis.

For example, in the case of a man admitted to the hospital for pneumonia, resolution was unaccountably delayed, and at the same time precordial pain developed while he was lying at rest in bed. This aroused suspicion; a history of past syphilis was obtained, and his blood reacted positively to the Wassermann test. Fortunately the therapeutic test was also positive. Under full doses of potassium iodide he improved steadily.

Prognosis.

Now it would be untrue to say that no benefit results from the treatment of aortic syphilis. Signs and symptoms become less pronounced, and may even disappear. Yet the ultimate prognosis is nearly always disappointing. In my own group of 103 cases I was able to trace the outcome, thanks to the help given by colleagues, in 88. The results agree closely with the experiences of others. We must say to ourselves, whenever we establish a diagnosis of cardiac syphilis, that its subject is not likely to live more than five years from the onset of symptoms.

The risk of sudden death must also be admitted in every case of cardiac syphilis, but I do not think the patient should ever be told about it. After all, sudden death does not occur in more than 10 or 20 per cent. of all cases of this disease; there are no distinctive signs by which we can pick out those that are likely to belong to this group, and even if we could, would this help us to prevent the catastrophe? For the sake of trying to seem clever it seems hardly worth while to add a burden of constant apprehension to the troubles of the patient.

At the same time, it is evident that the outlook is more favourable for those people whose circumstances and temperament enable them to live quietly, and avoid excesses, especially habitual excesses, of exertion and emotion. This point has not only a prognostic but also a therapeutic bearing. A mental picture of the state of the aortic wall is a powerful aid in correcting a too optimistic estimate of the amount of physical exertion which the cardio-syphilitic subject should be encouraged to undertake.

We have to remember that in the decades at which the symptoms of cardiac syphilis begin to be felt the normal deterioration in arterial elasticity has begun. It is very striking to see in the microscopy of these hearts a syphilitic lesion which injures the aorta grossly, but spares the coronaries, with the exception of their orifices, aided and

abetted by an atheromatous degeneration of the coronary trunks and branches. High arterial tension is therefore to be feared, since it is apt to accelerate this arterial degeneration. I am not, however, going to enter upon a discussion of the treatment of hyperpiesis here, but propose to limit my concluding remarks to a discussion of those measures which may be presumed to have some direct action on the syphilitic process.

Treatment.

1. The most efficacious is potassium iodide. It is difficult to adduce evidence in support of this statement, yet I am convinced of its truth, not only because this has been my own experience, but also of others who have had opportunities of judging. No one seems prepared to offer a satisfactory explanation of the action of potassium iodide on the later lesions of syphilis and the allied infections. Yet I take it that there is no therapeutic fact of which we are more certain than that potassium iodide gets rid of gummata. Now, these lesions of the aorta and the cardiac wall are not gummatous. Yet the action of potassium iodide in helping to diminish not only symptoms, but also signs, is, I think, not to be gainsaid. The patient with cardiac syphilis should begin to take potassium iodide as soon as the diagnosis is made, and he should go on taking it for the rest of his life. He will, of course, have holidays from it, but these holidays are to be prescribed for him, and not by him. One medical man whom I saw with this disease some years ago used to give himself iodine by inunction. He thought it upset him less than the salt taken by the mouth. It is easy to prove that iodine is freely absorbed through the skin by testing the urine for its presence; within half an hour after inunction it can be identified there. This method seems worth trying when the oral dosage is not well tolerated.

2. Mercury. I cannot claim to prove that mercury is more effective than organic arsenic, but it is certainly safer. Each is useful by reason of its spirillicidal properties, and one should, even at this eleventh hour of the syphilitic day, hunt down spirochaetes with undiminished zeal. This is not to say that organic arsenic ought not to be given. We give it to almost all cardio-syphilitics in hospital, but ever since two of my patients died of exfoliative dermatitis and of gastro-enteritis respectively, in both cases during courses of organic arsenic, I have thought that these people must have been in some way unusually susceptible. Others tell me that they consider organic arsenic may actually increase the cardiac lesion in some of these patients. The plan which we follow now, therefore, is to prescribe the arsenic in relatively small doses at relatively long intervals; for example, 0.3 gram doses of novarsenobenzol are given at intervals of a week over long periods till 5 grams in all have been taken. Treatment by iodide and mercury is continuous, and a course of organic arsenic is added from time to time.

That we fail to do lasting good, even by the most careful plan of treatment, must, I think, be generally admitted; after all, this is no more than we should expect. What hope is there of persuading ruptured elastic fibres to join up again, or closed coronary mouths to open once more? The wonder is, not that treatment does so little, but that it does any good at all. No more impressive argument in favour of early and thorough treatment of syphilis could possibly be brought forward than a series of microscopical sections of diseased aortas. If there is any achievement of the syphilitic virus that signally deserves the title of "damaged goods," it is surely to be found here.

CONCLUSION.

This brings me back to the original purpose of these remarks—namely, to emphasize the fact that aortitis, a distressing and fatal malady, is the inevitable lot of the patient in whom syphilis is inadequately treated in the early stages. There is good reason for hoping that the campaign against venereal disease, which has given to everyone infected with syphilis an opportunity of early and thorough treatment, may succeed in its object and avert these disastrous sequels; but we cannot be confident of this, and it is therefore our duty to be ready for an increase in the incidence of cardio-vascular syphilis in general practice during the next decade or two.