SECTION 2 — SYSTEMIC AND CONSTITUTIONAL AFFECTIONS

CHAPTER 23

CARDIO-VASCULAR DISEASES

As most servicemen and women are drawn from a selected age group the varieties of cardio-vascular diseases seen among them differ in frequency from the distribution familiar in civil practice. If the preliminary screening of medical boards is carried out adequately, degenerative vascular disease should be comparatively infrequent, and be found only in the older age groups. No attempt seems to have been made to assist the general judgment of medical officers who have to assess the capacity of older men in the Services in this regard, but this matter is one rather related to the work of medical boards, and will be considered elsewhere. For the purpose of ordinary recruiting examinations special instructions were issued governing the estimation of the blood pressure, though of course this is a very incomplete measure of the capacity and integrity of the vascular system. Formal exercise tests were not as a rule employed, and no standards were laid down, and this wisely avoided undue reliance on the apparent accuracy of mathematical formulae. For the special requirements of the R.A.A.F. the test of blowing up and holding a column of mercury forty millimetres high was found valuable. Lawrence pointed out that it was possible to use trick methods by which true lung air pressure would not be registered, but that this could be circumvented by adding a small air leak to the apparatus.

1. *UNRECOGNISED CONDITIONS*

In spite of precautions, occasional instances of previously unrecognised congenital heart disease or symptomless organic conditions were occasionally seen; often they were not of any particular significance. Mitral stenosis was sometimes apparently missed; perhaps this is not surprising in view of the noisy conditions frequently prevailing in places where recruits are examined. Conversely, young men with perfectly healthy hearts were sometimes rejected for an alleged mitral stenosis, the only departure from the normal resting state being over-action of the heart from nervous causes. Experience proved that when an otherwise healthy, fit soldier is discovered to have a cardiac murmur, great restraint and discretion are needed to avoid the creation of a cardiac neurosis. Even a ward round has contributed to this unfortunate result.

2. *RHEUMATIC FEVER*

Rheumatic fever as a sporadic event has been seen occasionally. A least one epidemic occurred in the armed forces during the war. One

striking outbreak was observed in South Australia, principally in one unit of the Royal Australian Air Force. South Australia, in particular Adelaide, is known as one of the areas in Australia where acute rheumatism is not uncommon among children and young people. Wing Commander R. L. Thorold Grant studied this outbreak in detail. The unit involved was stationed in the old Exhibition Building in Adelaide. Both men and women were employed there, but the male patients far outnumbered the female; this was probably related to the fact that the members of the W.A.A.A.F. did not live there. At the time, 1943-1944, there was no special increase in the number of cases of rheumatic fever occurring in the civil community, as judged by the admissions to the Children's Hospital. Most of the cases conformed to the same type, that seen in juveniles; joint manifestations were on the whole minimal, but there was a high incidence of cardiac complications. This cardiac involvement did not always produce clinical signs, but electrocardiographic records taken at regular intervals revealed many unsuspected abnormalities. These changes usually consisted of lengthening of the *P-R* interval, disappearance of the *S*2 and *S*3, and elevation of the *ST*1 and *ST*2 above the iso-electric level. In many instances such changes were short lived. Sedimentation rates were not found always to be a reliable index of the presence of an active carditis. A history of sore throat commonly preceded the onset of rheumatic symptoms. Most of the patients were treated with salicylates over long periods; sulphonamides were tried also, particularly for relapses, but many of the men were upset by the drug, and no striking results were obtained. The greatest problem in treatment was the handling of the patients over a long period; many were in bed for months, and relapsed when attempts were made to get them up. Even after cure had been apparently complete and the men were back on duty relapses occurred. No prophylactic doses of sulphonamides were tried. The disposal of convalescents in this area raised a problem also, as the available rehabilitation unit was in the hills, where the climate was cold and wet in the winter, and it was found that the men did better nearer the sea. While some of the men recovered well and returned to work, the impression given by this epidemic was that few of those affected were fit for service. It has, of course, been found that recruits with a history of past rheumatic fever are better to be rejected in most cases, unless there has been a long period of freedom from relapse. In 1941 there was an outbreak of rheumatic carditis in an internment camp at Hay. Twenty-eight German Jewish youths, aged 17 to 22 years, had clinical evidence of carditis following tonsillitis. Most of them had haemolytic streptococci demonstrated in throat swabbings, but none had involvement of joints.

3. *NUTRITIONAL CARDIO-VASCULAR DISTURBANCES*

Occasional instances have been seen of cardiac murmurs and enlargement associated with oedema in soldiers subjected to hardship and dietetic restriction which, though of definite degree, gave rise to no more than loss of weight and exhaustion in their fellows. Such unusual events are

probably akin to isolated and unexpected examples of deficiency states occasionally met in a civil community. With these few exceptions cardio-vascular disturbances due to gross nutritional disturbances were only seen among Allied prisoners of war in the hands of the Japanese. Unfortunately the medical officers of the 8th Division during their captivity had many opportunities of observing these states, and their observations were typical of those made in many other places under Japanese occupation. The varieties of circulatory affections seen included oedema, with or without cardiac failure, and cardiac emergencies. Undoubtedly oedema was in many instances due to protein deficiency, without any additional element related to the mechanics of the circulation. But exact classification in aetiological terms was as a rule not easy; dietetic deficiencies were certainly the underlying cause in most cases, but these were as a rule multiple. During 1942 and 1943 the term "cardiac beriberi" was used for many of these conditions, but there is no doubt that there was a grave lack of protein and other essential substances in the dietary of the prisoners as well as thiamin, and the diagnosis was recognised later as one which could not always be sustained on scientific grounds. But, though not always accurate as a clinical description, it had another value. It was one of the few labels that the Japanese understood or would heed, and therefore had some use as a basis for argument in the constant struggle to obtain a reasonably adequate ration. Major Bruce Hunt, senior medical officer with "F" Force, drew up a special report on the subject, based chiefly on the study of 100 British and Australian soldiers, who were used by the Japanese for work on the Burma-Thailand railway. "F" Force, of which they formed a part, suffered terrible privations, and lost up to April 1944 over 3,000 British and Australian men from a total of 7,000. These deaths were due to a combination of diseases of infective and nutritional types and amongst both those who died and many of the survivors were seen extreme examples of deficiency states. In all but two of the camps they occupied the thiamin-non-fat calorie ratio was below the safety level. Oedema was common, often of gross type and associated with effusions into the serous sacs. Some of these men with oedema had neuritic manifestations also, and some had cardio-vascular disturbances, which were also observed in men who had no oedema. The signs and symptoms referable to the heart included palpitation, either spontaneous or induced by exertion, a rapid heart rate, or occasionally an unduly slow rate, irregular rhythm due to extrasystoles or to auricular fibrillation, shortness of breath, a sense of oppression or pain in the chest, dizziness and syncope. Splitting of the first heart sound causing gallop rhythm was often noted, and in half the patients a loud systolic murmur was heard over the heart. Definite cardiac failure occured in a number, predominantly of the left side of the heart. Ventricular arrest occurred in some instances, causing Stokes-Adams attacks. These were recurrent, and sometimes ended fatally. Sudden deaths occurred also in men who had not been thought ill. The only common factors in these sudden cardiac deaths appeared to be that the men had all been existing on an insufficient diet for at least three months,

with a thiamin-non-fat caloric ratio of less than 0.3, had suffered intercurrent infections, and had frequently undergone severe physical strain 12 to 36 hours previously. A number of sudden deaths occurred after train journeys, which were associated with so much fatigue and hardship that they were an ordeal even to men who were relatively well. Following the return of the force from the jungle working camps a more adequate diet was available, and after a period of six to eight weeks no more sudden deaths took place.

It is of interest to follow the remnants of "F" Force after the men returned to the Changi gaol area. Here they could be compared with men admitted to hospital from Allied working parties working under varying conditions of privation. Observations were made and recorded by Lieut-Colonel W. A. Bye, A.I.F., and Lieut.-Colonel W. J. L. Neal, I.M.S. The study of these men made by Major Bruce Hunt while they were in the Kanburi hospital camp in the early part of 1944, showed that they suffered greatly from the local conditions, and, while those in Changi were meagre and poor enough, they were better than those prevailing in the Thailand camps or in Kanburi. It was noticeable that many of the men still complained of shortness of breath, dizziness, palpitation and tightness in the chest. Most of them had been under treatment in Kanburi for many months, and many men were still only lying or sitting on admission to Changi. Usually they made no spontaneous complaint of symptoms referable to cardiac disease; the men were on the whole fatter than the other patients, though flabby in condition, and, while they felt anxious about their condition, they wished to be free from restrictions. The diagnosis of cardiac beriberi had been based chiefly on objective signs such as irregularity and abnormal heart sounds, and was justified in view of the great frequency of thiamin and other deficiencies and the high death rate in the force, largely due to beriberi combined with other infections such as dysentery. Moreover, the Japanese were aware that cardiac emergencies of the type known to them as *"shoshin"*, due to thiamin deficiency, were occurring.

Bye and others in Changi concluded that the condition of these men at the time of their return was not due to beriberi, but to neuro-circulatory asthenia. Steps were therefore taken to verify this diagnosis. Clinical examination showed that the men had a reasonable exercise tolerance, and no enlargement of the heart was detected. X-ray examination of these men was carried out by Major Uhr, who used a standard technique, with the distance from target to screen 27 inches, and employed 3.5 milliamperes and 39 to 45 kilovolts. The results were compared with those obtained by examining a control group of 300 other men undergoing routine check of the lungs. Further comparison was made with two control series, one a group of men from the Changi area who had signs of cardiac disease such as oedema of the feet or face, dyspnoea and oppression in the chest, and the other a group, chiefly Dutch, who came from Pulau Damah Laut working camp, and had signs of gross oedema. The "normal" size of the heart in Changi was found to be smaller than usual,

the heart-lung ratio being 1 to 1.25. The ratio was considered to be pathological when it exceeded 1 to 1.4; it sometimes rose to 1 to 2. Judged by these standards only a small number of men could be classed as having true cardiac beriberi, the chief criterion being radiologically demonstrable enlargement of the heart. When present such enlargement affected the left side predominantly in 66 per cent, the right side 6 per cent, and 6 per cent both sides. Signs of pulmonary oedema were seen, but not constantly, and pleural effusions were uncommon. The men who had proven cardiac enlargement, which was believed to be due to beriberi, were re-examined after two months, when the size of the heart was found to be decreased.

In the majority of the group of 130 men from the Thailand camps no radiological abnormality was found; in only three was the heart-lung ratio increased as seen on the fluorescent screen. On the strength of these results the medical staff at the Changi hospital decided to encourage these men to resume activity again, and placed them on graduated work. This decision carried definite responsibility, but was important. The men had shown evidence of severe malnutrition, and severe anaemia, the haemoglobin value ranging from 70 per cent to 30 per cent, and had suffered from extensive ulcers, dysentery, malaria and other infections, and had without doubt also had varying degrees of thiamin and other deficiencies. Nevertheless the verdict that their hearts had not sustained damage was immensely important to them and to the force. It was considered very doubtful if these men had had true cardiac beriberi, if so it was probably of mild degree. Follow-up of these men was made as far as practicable, and their progress was found satisfactory. No unexpected fatality occurred in this group.

This experience led to a reconsideration of the exact diagnosis of cardiac beriberi, apart from the general use of the term. Bye concluded that cardiac irregularities could not be attributed to thiamin deficiency alone, unless they disappeared after the administration of thiamin. Extra systoles were often found in patients with beriberi, also regular patterns of irregularity, such as bigeminy. They were also common in patients who had no overt signs of beriberi. It was concluded that the diagnosis of cardiac beriberi could not be made with certainty without spontaneous symptoms of heart failure and radiological evidence of cardiac enlargement. The physical signs found in patients believed to have cardiac beriberi included evidence of enlargement of the heart, systolic murmurs at the apex, split heart sounds, irregularities, filling of the neck veins, rales at the bases of the lungs and rarely attacks of pulmonary oedema. Such patients occasionally had sudden attacks of cardiac arrest which will be discussed separately.

Similar experience had also accumulated in Nakom Paton, the huge hospital terminal at which sick men were concentrated after the completion of the Thailand railway. Lieut-Colonel A. E. Coates, chief medical officer, obtained a special report on the subject of cardiac beriberi from Major W. E. Fisher in November 1944. Fisher considered that a general

diagnosis of beriberi for all forms of oedema was justified, as it was certainly an important factor and the only one significant in the eyes of the Japanese. He did not think, however, that all varieties of disturbances of rate or rhythm warranted a label of "cardiac beriberi", and recognised the danger of communicating to the men the idea that their hearts were damaged. After reviewing a number of men with apparent cardiac disabilities associated with malnutrition he concluded that while they had some signs of thiamin deficiency, these were not then progressive, and that most of their debility was due to general causes and not to a specific dietary defect. There was always a remote possibility of cardiac manifestations appearing without warning in the subjects of any type of beriberi, but on the other hand, numbers of Dutch patients from Java were treated at Nakom Paton with severe beriberi, and though they required massive doses of thiamin to relieve their symptoms, at no time did they show any signs of cardiac disease.

These observations made in several Japanese prison camps in widely separated areas are of great interest. They illustrate how important it is to be sure whether circulatory symptoms are due to true cardiac affection or not. In the original state of these men there were disturbances of cardiac function, yet when the associated general conditions were relieved they made good recoveries in spite of the fact that the thiamin level in the diets of the hospital areas was still subnormal, though higher than the levels previously available. The opinion of these investigators that the majority of the men's residual circulatory symptoms were due to neurocirculatory asthenia is surely correct, and has saved considerable unnecessary invalidity. This opinion was later reinforced by the medical officers of the 2/14th Australian General Hospital, which was sent to Singapore as the medical wing of a prisoners of war reception unit. In the course of their work they reviewed 1,230 men who had been in Japanese prison camps, and in routine radiological examination of the chest the radiologist noted the occurrence of cardiac enlargement. Only in some twelve instances were radiological evidences of enlargement of the heart found. Most of these were explained by some circulatory condition, such as hypertension, and only three were considered to be possibly due to deficiency diseases.

Cardiac emergencies fall into quite a different category. In a settled area like Changi camp opportunities arose to study these alarming and often fatal attacks. Occasional cases were seen in 1942, but when the men began to return from the railway working camps more appeared in "F" Force, especially during the last six months, when deterioration of the troops was evident. Sudden death without warning occurred occasionally. This was seen both in working camps and in more settled hospital areas, and frequently in men not previously regarded as ill or at most as mildly ill. Apparently this sudden cardiac arrest was due to rapid and complete breakdown in the conducting mechanism of the heart, in other words, unexpected heart-block. Less dramatic, but probably of identical cause, were the attacks of temporary ventricular arrest which were occasionally seen. Some patients recovered after many such attacks, others died after

a variable number. Adrenalin, preferably injected into the heart, terminated these attacks if given promptly, and careful watch was kept on men who had suffered such a seizure. The signs and symptoms were those of the familiar Stokes-Adams attacks. Some patients died in bed; in these exertion could not have been a factor. Hunt, quoted above, thought that exertion played a part in those deaths seen among his patients, but the conditions there were much more unfavourable and severe. Post-mortem examination revealed no evidence of coronary disease, the heart was pale, especially in muscle nearer the endocardium, and no oedema was present. The right ventricle was often dilated without apparent cause. The cause was thought to be beriberi with other added factors such as anaemia and other nutritional defects. Malaria and dysentery seemed in some instances to have some predisposing influence. It is perhaps significant that beriberi appeared in Changi one month after the capitulation in 1942, and was relieved only when Red Cross supplements arrived in October 1942. The first sudden cardiac death occurred at the end of March 1942. It was early recognised that if beriberi was the cause of these cardiac emergencies, it was curious that no other systemic manifestations of this state were usually evident. Though no observations were made suggesting that diphtheria might be a likely contributory cause, it is one always possible. In 1943 diphtheria was rife for a time on Singapore Island in some of the camps, the cutaneous type was common and a considerable number of neuritic complications occurred. But among over 100 patients no cardiac complications were found, other than tachycardia in three cases. There is thus no evidence that these emergencies bore any relation to a diphtheritic infection.

4. *EFFORT SYNDROME*

Officially the diagnosis of "disordered action of the heart", so common in the 1914-1918 war, was discouraged. Even the less objectionable "effort syndrome" and "neuro-circulatory asthenia" were considered undesirable. In the Middle East fixation neuroses were not uncommon, but only a few involved the circulatory system; somatic symptoms much more frequently fixed on the digestive system. Fitts and others pointed out that one factor in this was the lessened physical strain on the soldier of 1940 as compared with that imposed in 1914-1918. Physicians recognised, too, how much harm could be done by directing attention to harmless physical manifestations of anxiety or fatigue. In 1940 the Royal Australasian College of Physicians, following a discussion on "The effort syndrome", made some recommendations to the Director-General of Medical Services of the Army for his information and help. These were designed to prevent neurotic incapacity similar to that produced in the previous war by a false assumption of organic damage of the heart. In October 1940 a suggestion was made by several physicians with the A.I.F. in the Middle East that a centre should be formed, preferably at a convalescent depot, to which Australian patients with "effort syndrome" could be sent. Even in this suggestion there was some echo of the teachings of the 1914-1918 war, but the objections to the usual diagnostic labels were realised. Later

Brigadier Burston, D.M.S., A.I.F., proposed that this syndrome should be officially known throughout the British forces as "temporary neuro-vascular debility", so as to avoid any suggestion of a permanent malady. However, the numbers proved to be few: some instances were seen in Palestine and Malaya, but the problem was never of sufficient importance to warrant special action.

In 1942 the position became rather different. War threatened the Australian mainland, and the Australian forces were engaged in tropical battlefields of peculiar difficulty. As pointed out in the section on psychiatry the proportion of cardio-vascular neuroses increased considerably in men fighting in these jungles, mountains and marshes. Anxiety states with various fixations became common also on the mainland.

A technical instruction was issued in which the importance was stressed of not ascribing symptoms to the heart except with sound reasons. In this it was stated that

"in a man who has been badly shaken by warlike operations a group of visceral sensations is experienced, cardio-vascular, gastro-intestinal and nervous, and the syndrome which becomes fixed in the ensuing neurosis depends largely on suggestion or on what particular form of disease he is most afraid of".

Medical officers were warned to avoid any suggestion that these symptoms may be due to heart disease, and directed not to label such men as suffering from any of the synonyms of "D.A.H." or even "neuro-circulatory asthenia". It was further stated that there was abundant evidence that even severe and prolonged exertion could not damage a healthy heart, and the grave disservice done by a false diagnosis of heart disease was stressed, the more grave since the harm once done cannot be fully eradicated. The only name officially permitted for use in evacuation to hospital was "N.Y.D. debility". It will be observed that even this tentative diagnosis is subject to the drawback of all "N.Y.D." diagnoses, with their inherent mystery without which many psychosomatic disturbances would perish of inanition. The strikingly infectious nature of these conditions was well illustrated in an outbreak of cardiac neuroses in a camp for Italian prisoners of war in Australia. A man who had suffered a slight muscular strain of the chest wall while digging was sent to bed by the Italian medical officer as suffering from a cardiac injury, and a characteristic neurosis of the "effort syndrome" type resulted. This was followed by a stream of similar cases. All the men presented the classic picture of cold bluish extremities, with pain in the centre and left side of the chest following exertion. They all belonged to one compound, while other compounds which were served by different medical officers had no men so affected.

More interesting still is the series already described among the men of the 8th Division while prisoners of war. These observations demonstrate how correct measures of full investigation and reassurance can be effective even in the face of risk of serious organic disease and disability. The same important principle emerged in the handling of typhus fever. To most medical officers the clinical manifestations of scrub typhus were a new field. The extreme prostration and serious condition of those severely

attacked, and in particular the post-mortem evidence of an intrinsic myocarditis caused a fear state to arise lest these changes should be permanent. The question has been dealt with in the section dealing with typhus, but it should be noted that in Australia as in other parts of the world a cardiac neurosis based on an attack of typhus could easily be produced.

5. *ANOMALIES OF RHYTHM*

Disturbances of rhythm *per se* have not been important in medical services. Extrasystoles were more frequently observed in conditions of exhaustion and malnutrition, but they have been but part of the clinical picture. In other respects this common form of irregularity was no more significant than in civilian practice. More important, though uncommon, were occasional instances of temporary bursts of disordered rhythm, particularly paroxysmal tachycardia and paroxysmal auricular fibrillation. These presented an occasional problem, especially when the patient held a responsible post. Full consideration of all the circumstances solves these problems. In one instance an officer with an important command had a paroxysm of fibrillation lasting several days, but his history was favourable, so he was permitted to carry on and did full service of an active kind for several years without further trouble. The more sinister attacks of the Stokes-Adams type seen in prison camps have been already described.

6. *DEGENERATIVE VASCULAR DISEASE*

The diagnosis and prognosis of degenerative vascular disease were often important in the work of medical boards, and in base hospitals, especially in assessing the condition of men in the higher age groups. These problems were much those of civil life, except that the possible physical demands on even senior officers could not always be foretold. Following current practice full investigations were more often called for, and as these inevitably included electrocardiographic examination, the question of supplying electrocardiographs to military hospitals arose. In 1940 General Downes, then D.G.M.S., ruled that hospitals going overseas would not take electrocardiographs, but sometimes private gifts of such equipment were made to individual medical officers for this purpose. With the establishment of base hospitals there was a greater demand for cardiographic tracings, and eventually an Australian type of electrocardiograph was issued to all Australian general hospitals. Climatic difficulties in the islands offset somewhat the value of this sensitive equipment, and maintenance offered difficulties. After a time a further difficulty arose that a diagnosis affixed to an electrocardiogram sometimes carried more weight in a patient's history than was warranted. Technical Instruction, No. 87, was therefore issued which stated that:

"It is undesirable that a diagnosis of myocardial or coronary disease should be made on the evidence of an electrocardiogram alone" and that "No diagnosis of a clinical condition will be made as part of the electrocardiographic report".

7. *OTHER CONDITIONS*

Among the rare events may be mentioned a few cases of unexplained cardiac failure. For example, a well-nourished man with no relevant history was admitted to hospital with increasing breathlessness, ascites and oedema, and after a brief illness died of heart failure. Autopsy showed that the failure was, as clinical events indicated, conspicuously right-sided; no cause was found. There was no evidence of rheumatic heart disease or diphtheria, or of coronary disease, or of sclerosis of the pulmonary blood vessels. Such events are described in contemporary literature and indicate the difficulty inherent in assessing cardiac disease. A few rarities such as temporal arteritis were seen. Other conditions do not merit special mention, except the importance of arterio-venous aneurysm in producing circulatory failure. Numbers of these lesions were produced by war injuries; the difficulties involved in complete cure are described in the surgical section of this volume. It is perhaps not irrelevant to point out here the physiological difference between the work imposed on the heart by voluntary muscular exertion even of the severest type, and that made necessary by the exigencies of maintaining a constant efficient circulation against an undue and inescapable load.

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