them, a carcass is rendered so unsightly by them that it is unfit for use. This has in the past led to the condemnation of such infected carcasses at the ports of London and Liverpool. It has been estimated (Commonwealth of Australia, 1917) that the discovery of the source of infection with worm nodules may eventually save Queensland over £1,000,000 a year if the grazier is aided in preventing infection.

Very little experimental work appears to have been done in Australia with any species of *Simulium* in connexion with the genus *Onchocerca*, although very numerous unsuccessful experiments are recorded with the larger biting insects such as tabanids. Yet *Simulium* is by no means unrepresented in Australia, several species having been described, one of which is suggestively named *furiosum*. Lea (1917) records a species of *Simulium* very abundant in the south-eastern parts of South Australia, occurring in thousands and causing series annoyance to horses and cattle. In view of the results obtained with *Simulium damnosum* and *O. volvulus* I would suggest that a species of *Simulium* may prove to be the carrier of *O. gibsoni* in Australia, or at least that this work on *O. volvulus* points to the desirability of carrying out a series of similar experiments with various species of *Simulium* and *Onchocerca gibsoni* in Australia.

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ANALYSIS OF A SERIES OF CASES OF CARDIO-VASCULAR SYPHILIS.

BY

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THIS article deals with 105 cases of cardio-vascular syphilis among in-patients of the National Hospital for Diseases of the Heart, London, during the years 1919 to 1923 inclusive. An inquiry was sent to each patient so as to ascertain, as far as possible, his subsequent history, and, where practicable, the patients were re-examined in June, 1923, on which date 21 cases could not be traced. All the patients had positive Wassermann reactions in the blood serum. The series includes three patients each with a history of acute rheumatism, none of whom had mitral stenosis. One case terminated in an infective endocarditis. The symptomatology and course of these cases were not unlike the others, and they have not been excluded. The youngest patient was aged 22, the oldest, 71, the average age being 48 years. There were 97 males and 8 females—an approximate proportion of ten to one. Of the 105 patients, 31 had a history of chancre, and the average time between infection and admission to hospital was twenty-four and a half years.

Cardio-vascular syphilis in the first twenty years of its course is a latent disease; once it manifests its symptomatology its progress is rapid, as is indicated in dealing with the mortality. Valvular involvement in the form of aortic regurgitation occurred in 81 patients; no organic valvular lesion was found in the remaining 24. The critical symptoms, single or multiple, were as follows: shortness of breath, 55 cases; pain (cardiac), 44; giddiness, 17; palpitation, 16; fainting attacks, 11; cough, 4; haemoptysis, 1; swelling of legs, 1.

The relation of these symptoms and signs to the presence or absence of valvular lesions may be tabulated as follows.

Signs and Symptoms in 105 Cases of Cardio-vascular Syphilis: Group I, with Regurgitation; Group II, with no Valvular Lesion.

(The percentages are of the respective groups, not of the total cases.)

Signs and Symptoms.	GROUP I (81 Cases).		GROUP II (24 Cases).	
	No.	Per cent.	No.	Per cent.
Dizziness and giddiness	34	42	13	54
Faintness	4	5	3	12
Shortness of breath	71	88	17	75
Loss of weight	3	4	2	8
Night sweats	2	2.5	—	—
Swelling of legs	20	25	3	12.5
Pain—Slight	30	37	10	41
" Moderate	13	16	5	20
" Angina pectoris	9	11	1	4
Cough	13	16	—	—
Haemoptysis (no aneurysm)	7	9	2	8
" (with aneurysm)	3	4	—	—
Epistaxis	2	2.5	—	—
Cyanosis	16	20	8	33
Pallor	32	40	2	8
Character of impulse:				
Faint	8	10	3	12
Slapping	12	15	3	12
Heaving	33	41	3	12
Signs of cardiac failure	20	25	3	12
Extra-systoles	6	7.5	4	16
Superficial arteries thickened	70	87	17	80

The average age of patients in Group I was 47 years; of those in Group II 49 years. The average time of infection before admission was: in Group I 25 years (24 cases); in Group II 24 years (7 cases).

Enlargement of the heart was detected in the groups of cases to the following extent. In the first group (of 81 patients with valvular involvement) slight enlargement of $3\frac{1}{2}$ inches or less from the mid-line to the left occurred in 2 cases (3 per cent. of the group); of moderate degree, 4 to $4\frac{1}{2}$ inches from the mid-line, in 13 cases (16 per cent.); and of great degree, or more than $4\frac{1}{2}$ inches, in 62 cases (77 per cent.). In the second group (of 24 patients without valvular involvement) the corresponding figures were: slight enlargement, 6 cases (25 per cent.); moderate, 4 cases (17 per cent.); great, 10 cases (42½ per cent.). Enlargement of the heart half an inch to the right of the right margin of the sternum was found in the first group in 21 cases (26 per cent.); an increase of 1 inch in 18 cases (23 per cent.); and an increase of $1\frac{1}{2}$ inches in 7 cases (9 per cent.). In Group II the figures were: half an inch in 6 cases (25 per cent.); 1 inch in 2 cases (8 per cent.); $1\frac{1}{2}$ inches in 1 case (4 per cent.). The average systolic pressure in the two groups was 154 in Group I and 141 in Group II. The pulse pressure was 86 in the first group and 52 in the second, while the difference between the systolic pressures of the leg and arm was 51 in the first group and 28 in the second.

The symptomatology of the two groups is not very dissimilar. There were no complaints of cough or bleeding from the nose in the patients who had no organic valvular lesions. Shortness of breath, the earliest symptom of failure of compensation, was somewhat more prevalent among the valvular group. Unusual symptoms were night sweats, haemoptysis (without aneurysm), and loss of weight. There was no evidence of pulmonary tuberculosis or of secondary infection of the cardiac valves in these cases.

Clinical Signs.

Thickened superficial arteries were not invariably present. The average systolic blood pressure in the brachial arteries was about 150 mm. of mercury; extremes (110 to 200) occurred, but were exceptional. At this particular time of life (45 to 50) arterio-sclerosis of a different type exists—the arterio-capillary fibrosis of Gull and Sutton. This is accompanied by a blood pressure higher than 150 systolic as a rule.¹ Where a systolic blood pressure of above 150 was found in the syphilitic cases there were probably other factors—either a high degree of aortic incompetence, or a complication of this diffuse form of

arterio-sclerosis. The blood pressure in the leg was generally higher than that in the arm, especially in the cases of aortic regurgitation. Dr. Strickland Goodall has pointed out that for a given degree of aortic regurgitation the greater the difference between leg and arm systolic pressures the better the prognosis. Dr. Goodall explains the difference as due to the existence of good vasomotor control. In a failing case of aortic regurgitation this control goes and the difference of pressure becomes less; hence the importance of this factor in immediate prognosis.

Enlargement of the Heart.—In the majority of cases the heart was greatly enlarged, but this was not restricted to cases of aortic regurgitation. The amount of enlargement varied with several factors—namely, the amount of regurgitation, the systolic blood pressure, and the state of compensation. In certain of the non-valvular cases with good compensation there was an enlargement of five inches to the left of the mid-line with a systolic blood pressure of 140 mm.; hence there was some other factor present which was not determined.

Aneurysm.—Of the 19 cases of aneurysm in this series aortic regurgitation was present in 17. In 15 of these the average systolic blood pressure (brachial) was 154 mm.; one patient had a pressure of 204 mm., but this must be regarded as exceptional. The height of blood pressure has no bearing on prognosis in these cases. It would be expected that those with the higher blood pressure would rupture the sac and die the earlier, but two patients with systolic blood pressures of 110 and 120 mm. respectively died within two years. Of the 19 patients, 10 had died within two years of diagnosis, and 5 were known to be alive; one patient was alive seven years after the diagnosis. The aneurysmal sac was seen and confirmed by x-ray screening in each case. The sac was situated intrapericardially in one case; it involved the ascending aorta in 7 cases; the arch in 6 cases; the ascending aorta and arch in 2 cases; the arch and thoracic aorta in 2 cases; and the thoracic and abdominal aorta in one case. There was also one case of aneurysm of the right coronary artery. The pressure of the aortic aneurysm was not accompanied by enlargement of the heart in one case of this series; there was no valvular lesion, and the systolic blood pressure was 130 mm. of mercury. Another patient died from a huge aneurysm involving the descending thoracic and abdominal aorta. He was a large man and a stoker by trade; his heart weighed 14 oz. *post mortem*.

Various Minor Signs.—Of the 105 cases albumin was found in the urine of 18 cases only; it was not a constant constituent. Albuminuria is therefore not a sign of cardiovascular syphilis; its occasional appearance is not explained, as it was present in cases without cardiac failure and without renal involvement. In syphilitic heart disease tachycardia of high degree plays no part. The highest pulse rate of each patient while in hospital was recorded; the average of these rates was 105 a minute. The cardiac pain might be described as mild, moderate, and severe. The mild type was limited to the precordium, the moderate type radiated somewhat, and the severe form had the distribution of classical angina pectoris. These three types were phases of the same symptom, for in several cases the mild type became more severe with progress of time. About 75 per cent. of the patients had cardiac pain in the course of the disease—an incidence greater than that of other forms of heart disease. There were 10 cases of auricular fibrillation and 21 cases of heart-block; in 14 of the latter the auriculo-ventricular interval was greater than one-fifth of a second, 4 had a right bundle lesion, and one a complete auriculo-ventricular dissociation. One had an acute gummatous infiltration of the main bundle with invasion of other parts of the heart musculature. The latter case cleared up completely with treatment. Three of the patients with heart-block had Stokes-Adams attacks with loss of consciousness and twitchings; in these three the attacks were of short duration only. Involvement of the central nervous system was indicated as follows. In one case there was a pseudo-bulbar paresis. The tendo Achillis reaction was absent on one or both sides in 9 cases, and the knee-jerks in 4. In 4 cases the pupils were of the Argyll Robertson type; in 3 cases they were unequal; in 2 irregular; and in 2 sluggish in reaction to light.

Electro-cardiographic Findings.

Electro-cardiographic investigations were made in 66 cases with aortic incompetence, and in 19 cases without organic valvular lesions. Of the latter, 6 showed left ventricular preponderance; some of these had a normal systolic blood pressure; 44 of the 85 cases photographed showed this type of preponderance. Fifteen cases showed inversion of the r wave in the second lead. In cases where electro-cardiographs were taken at intervals of months there occurred an improvement in the general condition, where there was a change from an inverted r to an upright r. Forty-nine of the other cases showed delay, or delay and diminished amplitude of the wave. Of 85 patients 64 showed changes in this wave. Among those dead at the end of 1923, 21 cases had been electro-cardiographed; 15 showed changes in the r wave; of the other 6, 2 had aneurysms, one had a bizarre Q.R.S. complex in one lead, one had heart-block, and the last had auricular fibrillation. There is evidence here that changes in the r wave in the second lead are significant of severe myocardial damage.² Another point of importance in these photographs is the appearance of a small notch in the Q.R.S. complex (see accompanying tracing).

If this notch is seen in a case of unknown etiology a Wassermann test should be performed. The pathogenesis of this notch is unknown at present; it appears occasionally in other cases of myocardial mischief than those due to syphilis, and it renders the prognosis somewhat more serious. Twenty-five patients of the series showed this notching; of these, 6 were dead in 1923, one was alive three years and one four years after it was found. In the others this notch was noticed only in 1923 and the majority seemed to have a serious prognosis according to clinical findings. Two patients in whom the notching appeared in a series of photographs died during their stay in hospital. In a third patient the notching became less under treatment and he improved in health at the same time. In one case the r wave in the second lead became depressed during the attacks of angina pectoris. Willis and Barnes from the Mayo Clinic report similar occurrences with myocardial infarction.³

Mortality.

Down to the end of 1923 thirty patients had died out of 105, or 28 per cent.; 21 cases were not traced, hence the mortality was 36 per cent. of the total number traced. The average duration of symptoms before death was 4.2 years, the limits being one to twenty-two years. The deaths occurred on an average one year after the first admission to hospital. The course of the disease is rapid when once established. In 28 of these cases the heart was greatly enlarged; of the 2 other patients one had heart-block with Stokes-Adams attacks and the other had angina pectoris. A grave prognostic value must be attached to the signs of cardiac failure—namely, venous pulsation signs at the bases of the lungs, oedema of the legs, enlarged liver of the congestive type, and ascites. One or more of these signs had appeared in 22 of the 30 cases; 14 other patients showed some signs of cardiac failure and were not dead by the end of 1923.

Ten cases of auricular fibrillation occurred in the series; of these, 2 patients died. Some were known to have been fibrillating for several years. There were 21 cases of heart-block and 5 patients died. Six patients had bundle lesions or auriculo-ventricular dissociation; of these, 3 died and 3 were seriously ill.

Nine patients who died had aneurysm of the aorta; one

had aneurysm of the coronary artery. Angina pectoris occurred in 10 cases and 3 patients died. Among 11 necropsies no gross changes were found in the kidneys. In 2 cases adherent pericardium was found. The weight of the heart ranged from 23 to 32 oz., all being much enlarged. It appears that syphilitic pericarditis is a clinical entity; it was diagnosed in yet another patient who did not die. In South Africa a haemorrhagic blood-stained pericardial effusion occurs in natives with a positive Wassermann reaction in the serum; this is relieved by tapping and antisyphilitic measures.

Distinction between the Aortic Regurgitation of Rheumatism and that of Syphilis.

Rheumatic cases generally appear in young adults; syphilitic cases in the middle-aged. A history of the rheumatic infection may often be found, whereas that of syphilis is most difficult to elicit; it was only present in 27 per cent. of this series.

In the great majority of rheumatic cases there is a definite stenosis, with the typical facies; the aortic valve is generally the first to be involved in acute rheumatism. Confusion is caused sometimes by the occurrence of the presystolic murmur at the apex in cases of pure aortic regurgitation (Austin-Flint murmur). The distinction may be made by (1) the facies; (2) the pulse pressure, which is greater in aortic regurgitation with the Austin-Flint murmur, smaller in mitral stenosis and aortic regurgitation; (3) the pulmonary second sound is accentuated in mitral stenosis.

As pointed out by Dr. Strickland Goodall, in rheumatic cases the general progress of the disease is from the left cusp of the mitral to the left posterior cusp of the aortic valve; they have a common blood supply, and the aortic wall is not affected as a rule. The diastolic murmur is therefore blowing in character, and its area of maximum conduction is down the left side of the sternum. In syphilis the aorta is roughened, and the cusp most often involved is the right posterior. Hence the murmur is harsh in quality and the maximum conduction is down the right side of the sternum. In syphilis the accompanying signs in the central nervous system are of great diagnostic value. The arteries are thickened in pure rheumatic cases only where the pulse pressure is extremely high from large degree of aortic regurgitation.

Treatment.

Large doses of potassium iodide were usually employed, and mercury by inunction of blue ointment; in some cases arsenobenzol compounds were given intramuscularly. The intravenous administration was followed by some fall of blood pressure. The impression received from the cases directly supervised was that arsenobenzol compounds were unsuitable for the later stages of cardio-vascular syphilis. Digitalis was used in conjunction with iodides and mercury where cardiac failure was present.

In two cases of aneurysm of the aorta pain was greatly relieved by the administration of doses of horse serum twice a week or of haemoplastin twice a week. The explanation offered is that clotting was produced in the sac.

Conclusion and Summary.

1. The age incidence, the sex incidence, and the latent period after infection are similar in cardio-vascular syphilis and tabes dorsalis.
2. Once the symptoms and signs of cardio-vascular syphilis occur the course of the disease is, as a rule, rapid.
3. Signs in the nervous system are important in making a diagnosis.
4. The initial symptom is not constant, but in the majority of cases is either shortness of breath or cardiac pain, and, less often, giddiness and palpitation.
5. Cyanosis occurs in a greater percentage of cases without aortic regurgitation, and pallor in a great percentage of cases with aortic regurgitation.
6. The superficial arteries are thickened in the majority of cases, but the blood pressure is rarely above 150 mm. of mercury. Such a thickening with a similar rise of blood pressure occurs in the senile form of cardio-vascular degeneration.¹ Systolic blood pressure in the leg is greater

than that in the arm, especially in cases with aortic regurgitation.

7. The heart is often much enlarged even in cases with no aortic regurgitation, and where the blood pressure is low.

8. A syphilitic myocardial degeneration may occur without valvular mischief, and sometimes without thickening of superficial arteries.

9. Cardiac pain is often mild in degree at the beginning and progresses to true angina pectoris.

10. Different portions of the heart and blood vessels are affected maximally in different cases.

11. There is often an inconstant albuminuria of no significance.

12. The electro-cardiograph findings which have a prognostic value are: (a) Changes in r wave in lead 2. (b) Occurrence of interference in auriculo-ventricular conduction. (c) Notching of the Q.R.S. complex. (d) Auricular fibrillation.

13. The signs of cardiac failure are also of prognostic significance.

14. The mortality of the disease is high, once it has passed out of the latent stage.

15. It is necessary to diagnose these cases in the latent stages so that treatment may be more successful.

16. The distinction between aortic regurgitation of syphilitic and of rheumatic origin is necessary on clinical grounds.

17. Haemostatic serum is useful in certain cases of aneurysm with pain.

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THE EFFECT OF POSTURE ON CASES OF PNEUMOTHORAX.

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WHEN a patient with pneumothorax moves from side to side or from the recumbent to the erect position the intrathoracic pressure is altered, and the intrathoracic viscera and any effusion that may be in the pneumothorax cavity are also moved.

Intrathoracic Pressure.

Dr. Lawson¹ pointed out that this pressure varies with posture in cases of artificial pneumothorax. The variation may be very considerable, and this should always be borne in mind when giving a refill. Some physicians give refills with the patient sitting in a chair, others with him lying flat on his back, and others with him lying completely or partially on one side. If we have records of previous refills it is usually possible to tell in what position they were given by putting a needle into the pneumothorax cavity and moving the patient until the usual pressure is found. If the patient lies on the pneumothorax side the weight of the viscera will render the intrathoracic pressure in the pneumothorax cavity higher than if he lies on the healthy side. In one of my cases the pressure was -4+2 with the patient lying on the left (pneumothorax) side, but -10-0 when he was lying on the right side. After a refill of 450 c.cm. of air the pressures were +1+3 and -5+2 respectively. In other words, when this patient was lying on the healthy side he could raise the pressure in his pneumothorax cavity as much by turning on to the treated side as by having a refill of 450 c.cm. It is possible, therefore, to use posture if we wish to stretch adhesions, for by making the patient lie on the healthy side a continual drag on the adherent areas would be produced. Of course posture will affect the