MENTAL CHANGES IN CARDIAC DISEASE.*

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MENTAL change in cardiac disease, though a rare complication, is a subject that can be properly and usefully discussed at a meeting of psychiatrists at which physicians are asked to take part. For while the physician may be able to assess accurately the physical defect in the circulatory apparatus, he is trained only in a rough-and-ready way to interpret different types of character, and the way in which they react to disease, and is liable to go astray in his interpretation of mental states. There is also this advantage—that in the present state of uncertainty as to the physical basis of mental disease we cannot look at the subject from too many points of view.

The influence of changes in cardiac action on mentality need not be limited to the effects of cardiac deficiency on the circulation in the brain, to variations of blood-pressure, blood velocity, and the consequent alterations in oxygen and carbon dioxide tension in the cerebral tissues; we must be prepared to accept, if proved, secondary effects from changes in glands and other organs disturbed by the same circulatory changes. Our knowledge of the physiology of such circulatory changes as produce alterations in the mind is extremely fragmentary, and related rather to states of consciousness than to mentality. I need only mention in this connection the classical experiments of Kussmaul and Tenner and those of Leonard Hill.

For the purpose of this discussion, however, it is better that the approach should be from the clinical side. Most of us have made observations on patients showing mental symptoms in cardiac disease, and by a winnowing process of discussion there may emerge some facts that will be helpful or important. Certain cardiac conditions are thought to be commonly associated with particular mental states. Pericarditis, for instance, in children

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or young adults sometimes produces querulousness and neurasthenia. Angina pectoris, again, is occasionally associated with emotionalism and irritability. The fits of anger to which John Hunter was subject have been so explained. Again, the cardiac death in diphtheria is peculiar and characteristic. Though I have no personal acquaintance with it I believe it is true to say that children who die from cardiac failure in this disease are acutely conscious until the final stupor, that they may be aware of approaching death, and, unless they have somebody to sit by them and talk to them, may suffer agonies of apprehension and fright. The gradual lowering of blood-pressure under similar conditions in older people seldom causes more than a feeling of exhaustion or a desire for sleep. The sense of impending death in angina pectoris is a problem in itself that I think had better be left out of the discussion so as to avoid wordy and unsatisfactory explanations. Aortic regurgitation, again, especially the syphilitic variety, may be associated with impulsive insanity.

The available literature is very restricted and fragmentary, and it is only necessary to refer to it briefly. A clinical study approached from the aspect of psychiatry, by Mickle in the Goulstonian Lectures for 1888 throws considerable light on the behaviour of mental patients as the result of variations in the efficiency of the cardiac mechanism. Some observers have suggested that specific cardiac disorders will produce one of a range of mental states—an hypothesis which is very unlikely and unwarranted except from the study of an enormous number of cases, a study which has yet to be undertaken. T. S. Clouston* spoke of "cyanotic delirium" and "cyanotic insanity" from lack of oxygenation of the blood. This form, seen in bronchitis, cardiac failure and asthma is, according to Clouston, a form of delirium with confusion, hallucinations of sight, sleeplessness, sometimes suicidal impulse and vague fears. The patients are usually worse at night, and often end in mental torpor passing into coma. It is more commonly seen in persons of advanced age than in young people, and would appear to depend on some degree of arterial change, or possibly of inherited disease.

Carey Coombs,† in reviewing his own 2,000 cases of cardiac disease, finds no support for the view that cardiac disease in itself is responsible for mental disorder. He notes the fact that children with rheumatic heart disease are often abnormally quick and mentally active. Coombs found only 10 cases of insanity associated

* *Clinical Lectures on Mental Disease*, 6th edition, London, 1904, p. 363.
† *Journ. Ment. Sci.*, London, 1928, lxxiv, p. 250.

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with rheumatic heart disease. The changes in mentality seen in older persons with cardiac disease he attributes to the effects of senile changes.

In some cases, indeed, the process at work, *e.g.*, syphilis, may affect both heart and brain, and the effect on the brain, rather than on the heart, may be the cause of the mental aberration.

From the psychological side, Riesman* says that cardiac patients are often depressed and irritable, particularly if decompensation is present; that hallucinations of sight and smell are common, especially in aortic disease. He also mentions confusion in regard to time. Some patients alternate between apathy and excitement, and require watching. Others show acute mania which defies control. Our prognosis, Riesman says, is governed by the state of the circulation; if the patient's heart recovers, his psychosis will disappear.

J. L. Van Lier† notes that when a person predisposed to mental disturbance acquires heart disease the character changes and irritability, readiness to anger and anxiety show themselves, and he urges the treatment of the physical defect as a means of overcoming the psychical abnormality.

It is probable that different types of persons with different psychological tendencies react differently to the stress of cardiac disease, and it is possible that the incidence of mental changes in cardiac disease may be very different in different races. If the psychological reactions of the northern nations are compared with those of the Latin races or the Jewish race the probable differences are at once apparent.

Clifford Allbutt, writing in the *Provincial Medical Journal* for 1885 on "Cardiac Delirium," mentioned that he had been unable to find any mention of the condition in medical works of reference. He doubted whether in cardiac failure the mental condition is due to the retardation of venous return. He asserted that in the majority of cases the mental alteration is slight enough to be referred to the whims of a sick person, but that in more severe cases it takes the form of a delusion of place. The patient thinks himself to be in a strange hotel or house, and implores to be taken home. The article was apparently written to draw attention in the main to the phenomenon itself, as no clinical cases are given in detail.

* D. Riesman, *Amer. Journ. Med. Sci.*, Philadelphia, 1921, clxi, p. 157.

† *Nederlandsch Tijdschrift v. Geneeskunde*, Amsterdam, 1925, ii, p. 2661; abstract in *Journ. Amer. Med. Assoc.*, 1926, i, p. 660.

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For the purpose of the discussion I am charged to introduce it will serve better to go to the sources that have been at my disposal: to examine a series of hospital cases with *post-mortems* and to analyse a series of private cases. In hospital cases I include those who have died from cardiac disease or in whom cardiac disease has been found at the *post-mortem*—cases that have, therefore, been verified as having suffered from cardiac disease—but we shall expect amongst them that only the grosser forms of mental disease will be recorded, for in hospital mental changes are often a mere incident. Amongst the private cases there is a possibility of diagnostic error as regards the heart, but the mental state will have been more accurately noted, for not only has it been my habit to record slight changes of character, but there will also be symptoms that would be the subject of comment from the patients' relatives.

There is this, however, to be said in regard to hospital and private patients alike: that they may suffer from the grossest forms of cardiac failure, and may show no mental change beyond that of gradual enfeeblement of mind as well as body. I have notes of cases of ischæmic necrosis of the cardiac muscle in which the left ventricular failure has been extreme and yet the mind has been calm and clear; it is under these circumstances that the patients with a high grade of mentality come out best.

And again my observation is that in congestive cardiac failure we see the same dogged fortitude in hospital and in private patients; it is as if the patient was forced to concentrate on the job of getting his breath, just as one has to do when climbing uphill.

> A solicitor, æt. 63, a very vigorous man, had been feeling seedy for two or three weeks; stairs tried him more than usual, and he was, unnaturally for him, disinclined to exert himself. At 9 a.m. one day at his office I found him ashen, apprehensive, but calm, with slight pain in the upper chest. He asked me to be plain with him as to the outlook. The pulse was completely irregular, with intermissions and poor tension. At 3 p.m. on the same day he was a fair colour, the pulse 100, steady and full. The first sound was poor. He had another attack on going upstairs to bed that night. He improved slightly during the next two days. On the morning of the fourth day from the first attack, after a very bad night, his pulse was regular and full, but there was pain in the chest, and he was compelled for relief to stand leaning over a table. His mind was clear and he kept his accustomed equanimity. At 3 a.m. the next morning he had orthopnœa with blueness. The pulse was irregular in tension, the respirations were 24, and there was no œdema. On the sixth day, after a restless night, there was a bout of pain in the chest, and he died as the doctor in attendance was preparing an injection of morphia.

Though in this case the break-up of the cardiac mechanism was violent and rapid, there was never any swerving of the mind from its accustomed path.

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The following tables summarize the cases in which heart disease and mental symptoms were associated:

TABLE I.—153 *Cases of Cardiac Disease in* 2,000 *post-mortems* —7·6%.

	Cases.	Mental.	Percentage
Mitral stenosis	30	5	16·6
Fatty infiltration	26	4	15·3
Various	97	6	6·1
Total	153	15	9·8

Mitral stenosis: Delirium, 4; slurred speech, 1.

Fatty infiltration: Suicide, 2; slowness and confusion, 1; "mental symptoms," 1.

Pericarditis: Mentally peculiar, 1.

Ulcerative streptococcal endocarditis: Delirium, 1.

Aortic insufficiency: Delirium and slurred speech, 1.

Malignant aortic and mitral disease: Mental deterioration, 1 (cerebral hæmorrhage).

Ischæmic necrosis: Mania (delirious, shouting), 1.

Auricular fibrillation (alcohol): Delirious, 1.

TABLE II.—*Mental Symptoms in* 127 *Private Cases.*

	Absent.	Present.	%
Ischæmic necrosis	26 (2)	7 (0)	21·2
Hyperpiesis	15 (5)	1 (1)	6·2
Auricular fibrillation	11 (4)	2 (1)	15·3
Angina pectoris	6 (1)	4 (0)	40·0
Dilatation	16 (3)	5 (0)	23·8
Heart-block	4	4	..
Aortic	5	1	..
Rheumatic fever, mitral	4	3	..
Infective endocarditis	4	1	..
Extra systoles	0	2	..
Aortic stenosis	3	0	..
D.A.H.	1	1	..
Pernicious anæmia	0	1 (1)	..
Total	95	32	

N.B.—Numbers in brackets indicate those with congestive cardiac failure.

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The following table gives the number of times particular mental symptoms have been noted:

Total number of patients, 32.

Major symptoms:	
Cases requiring treatment in a mental hospital	4
Aphasia	2
Hallucination	1
Drug addiction	1
Confusion	4
Hysteria	1
Total	13
Minor symptoms:	
Neurasthenia	13
Irritability	2
Apprehension	1
Emotion	1
Depression	1
Psychasthenia	4
Total	22

TABLE III.—*Mental States in Certain Cardiac Conditions* (Private Cases).

Ischæmic necrosis	7 cases.	Depression.
		Apprehension.
		Hallucination of hearing, wandering (aged 81).
		Wandering.
		Confusion.
		Depression.
		Neurasthenia.
Hyperpiesis	1 case.	Depression.
Auricular fibrillation	2 cases.	Mania, slight hallucinations.
		Neurasthenia.
Angina pectoris	4 ,,	Depression.
		Irritable.
		Verbal amnesia, neurasthenia (Hebrew).
		Drug addict.

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Dilatation (various)	5 cases	Psychasthenia.
		Neurasthenia.
		Asthenia.
		Confusion.
		Attempted suicide.
Heart-block . .	4 ,,	Aphasia and incoherence.
		Wandering.
		Neurasthenia.
		Irritability.
Aortic . . .	1 case.	Asylum case (syphilis).
Rheumatic fever .	2 cases.	Hysterical fits.
		Hospital case, auricular fibrillation.
Mitral disease .	1 case.	Neurasthenia.
Infective endocarditis	1 ,,	Emotional.
Extra systoles .	2 cases.	Apprehension.
Pernicious anæmia	1 case.	Depression.
D.A.H. . .	1 ,,	Depression and psychasthenia.

Illustrative Cases.

Mrs. S—, æt. 56, was sent to me in August, 1929, by Dr. Abraham, of Brightwalton. The history was that she had had a bad heart for several years, though it had not been necessary for her to lie up. In 1915 she had had an operation on the womb without ill-effect. There was no history of rheumatism. On June 25, 1929, she was seen by Dr. Abraham for herpes zoster; this cleared up, but left her very weak owing to loss of sleep. For two weeks previous to my seeing her she had been wandering in her mind and had had hallucinations. She was sent away to some friends in a neighbouring town in the hope of recovering her mental balance. She was there seen by a doctor, who recommended that she should be certified, as her conduct was peculiar. She was then sent home and I was asked to see her.

She was a pale, ill-looking woman, with numerous small veins on the cheeks. She had a somewhat irrational manner, and appeared to be taking no interest in what she was doing. I was not able to detect any mental abnormality that suggested that she ought to be certified, though she was more emotional than normal. She had a difficulty in finding the words proper to her thought, and made occasional mistakes, but she was quite aware of these. Her vocabulary was very restricted. The pulse was 84 beats per minute, very irregular, and the blood-pressure was 110 maximum, 70 minimum. The apex-beat was not obviously farther out to the left than normal, but was very feeble, and the jugular pulse was of the positive variety without visible auricular beats. There was a systolic murmur at the apex and another at the base which could easily be followed to the arteries of the neck. This murmur suggested a stenotic element at the aortic orifice, and it was confirmed by a very slight uprise to the pulse-wave. Nothing was detected in the abdomen, there was no enlargement of liver or spleen and no fluid. There was no œdema and fingers were not clubbed. There had been slight frequency of micturition at night, but the urine was normal. The sigma reaction was also normal.

In view of her fibrillating heart I suggested that though she had been on digitalis previously, the dose ought to be increased to the maximum she could take. This produced not only an immediate benefit to her cardiac condition, but also complete restoration to normal mentality. There were no physical signs of

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nervous disease, and the reaction to the increased dose of digitalis suggests that the heart was the organ mainly at fault.

Elizabeth S—, æt. 69, a patient of Dr. Firth, of Cowley, was admitted to the Radcliffe Infirmary on March 24, 1930. She had been under his care from December, 1929, when he had put her to bed because of a large ulcer on her leg. At this time she had an attack of vomiting lasting some days without any apparent cause. From that time till her admission to hospital she had remained practically bedridden. Her mental state varied very much. Some days she was normal and might sit out for a short time. On others she was slightly confused, "but a more noticeable feature was that she was very slow to understand a question, and took a long time to answer it." When admitted to the infirmary the heart was extremely feeble in its action, and she was judged to be dying from heart failure. She died in three days.

At the *post-mortem* examination the heart was rather larger than normal, 275 grm. as opposed to 253, and showed fatty infiltration. There was evidence also of early congestive cardiac failure in the other organs. From the slight enlargement of the heart it is justifiable to infer that in normal life her blood-pressure had been high. An observation by Dr. Firth in January, 1930, showed that the maximum blood-pressure was only 130. During her period in hospital it was always low.

Mary G—, æt. 48, was admitted to the Radcliffe Infirmary on July 16, 1928. The history was that for twelve months there had been pain in the præcordium, worse in the early morning, and dyspnœa on exertion. There had also been palpitation for three months. She had been getting pale and thinner and had had occasional attacks of faintness. There had been swelling of the legs for one week. There was no history of rheumatism, syphilis or anæmia. On examination she was in an early stage of congestive cardiac failure. The pulse was irregular and the heart was in fibrillation. The blood-pressure was 220 maximum, 95 minimum. The apex-beat was in the fifth space, 4 in. to the left of the mid-line. A systolic murmur was present at this spot. There was œdema of the right lung at the base and the urine contained no albumen. The sigma reaction was negative.

She was treated with benefit by digitalis in full doses, which were gradually lessened. Three days after admission she collapsed during the night. The pulse could not be felt and she was cold and clammy, but she gradually revived under stimulation by injections of "Curschmann." On recovery she refused to take anything by the mouth, her mental condition was unusual, she failed to get any sleep, but lay quiet. Then without warning she sprang out of bed and tried to speak to a neighbouring patient. She was then got on to a chair, where she sat for some time. Suddenly she got up and broke a window by throwing a chair at it. Her violence was with difficulty restrained by morphia and by potassium bromide and chloral, but she slept from 4 a.m. The next day was quiet, but she was excitable and wild in speech in the evening. Morphia gave her a good night and she then had three good days, though with slight returns of her mania. During these days her pulse became much stronger. On July 25 and 26 she complained of feeling muddled in her head and once talked in a strange manner. There was confusion also on July 31. The electrocardiogram showed auricular fibrillation with left ventricular preponderance. She was given a course of strophanthin intravenously from August 9 to 14, and was discharged well on September 1, with no signs of cardiac failure, but with persistent auricular fibrillation.

Harry H—, æt. 63, was admitted to the Radcliffe Infirmary on March 24, 1930, with a self-inflicted wound of the throat. He had been under Dr. Longton, of Oxford, for some months for albuminuria, but there had been no sign of cardiac failure during that period. There had been cyanosis, which had been attributed to emphysema. He had had, however, three attacks of œdema of the legs from which he had recovered. The only mental change noticed was that he had been depressed for a few days before he attempted suicide. He died in Hospital of cardiac failure. At the *post-mortem* there was marked emphysema, arterio-sclerosis and dilatation of the pulmonary arteries, hypertrophy of the right heart and congested (cardiac) organs.

Mrs. L—, æt. 50, was a woman of great energy and good mentality, though a labourer's wife. She showed great stoicism for several months during which she gradually went downhill with auricular fibrillation and congestive cardiac failure. Now and then, when the realization came upon her that things were going ill, she was slightly emotional. Later she became somewhat spiteluf

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to the sister and nurses, demanded more attention and was resentful if she did not get it. She also became ravenous in appetite, though she occasionally made herself sick. She begged for food from visitors.

A Clergyman, æt. 70, had led an extremely active life as a preacher and writer, and had enjoyed good health until August, 1917. He then began to lose strength, to complain of restlessness and loss of sleep; there was also some depression. He was a heavily built man, with raised blood-pressure and hypertrophied heart. Repeated examination of all his systems failed to show any physical alteration that could account for his symptoms. He was able to take his afternoon walk, though not so far as formerly. He had felt the war acutely. Sir William Osler, who saw him with me, thought that general arterio-sclerosis was the most likely cause of his symptoms. A course of strychnine which he suggested was not borne well and was discontinued. For five months the symptoms resisted all medicinal treatment. The one relief he obtained was from the visits of congenial friends. One morning the nurse who looked after him found œdema of his legs This was the beginning of congestive cardiac failure, which became steadily worse till his death in ten days' time. It would appear that the neurasthenic or psychasthenic symptoms were the earliest sign of cardiac failure; unfortunately there were no regular observations made on blood-pressure which might have revealed the mechanism by which the brain suffered in its action.

Richard E—, æt. 62, had never been robust, and had led a somewhat *dilettante* life as a student. I was called to see him one afternoon by his landlord, who complained that he was mentally deranged and ought to be placed in an asylum. I found him sitting in a chair, not having shaved that morning. He was slightly confused and had some difficulty in expressing himself. He looked ill, his pulse was very feeble and irregular, and though there was no congestive failure and no breathlessness or pain, it was obvious that he had a serious cardiac condition, which I took to be ischæmic necrosis following a coronary thrombosis. There was no sign of disease in the central nervous system. He was put to bed and arrangements were made for his nursing, but he never recovered his mental faculties, and died of cardiac failure in a little over a fortnight. A case of coronary thrombosis with delirium was recorded in 1919 by Herrick.*

Beatrice D—, æt. 59, a patient of Dr. Moore, of Watlington, suffered from albuminuria, became mildly maniacal and had ultimately to be certified. She was in the Warneford, where I saw her in an attack of cardiac failure following bronchitis and phlebitis. The cardiac failure was a terminal incident in the disease, but Dr. Neill informs me that her mental state was much worse when her cardiac condition was poor.

The considerations that emerge from this short presentation of the subject are as follows: That no explanation from the cardiological point of view can be given why one patient with a serious cardiac lesion is clear in mind while another shows mental symptoms. It is not always possible to postulate cerebral lesions or degenerative changes. The reason more probably lies in the manner in which patients with specific psychological tendencies react to circulatory and other changes. Mitral stenosis and ischæmic necrosis are more likely than other cardiac lesions to produce mental change. Mental symptoms due to faulty cardiac action tend to improve rapidly if the heart can be restored to normal activity.

One further point emerges, namely, that if we fail to make a physical examination there may be a danger of certifying a patient who ordinarily would not be certified.

* *Journ. Amer. Med. Assoc.*, Chicago, 1919, i, p. 387.

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