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(*Reprinted from the "Caledonian Medical Journal" for April, 1903.*)

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We are all aware that a close relationship exists between the body and the mind, and that morbid conditions of the former influence, to a greater or lesser degree, the latter. In good bodily health the condition of *bien-être* explains fully the happy state of mind that exists, and in bad health the mental faculties fall below par, as it were, and mental distress and suffering accompany the somatic symptoms.

In most diseases this sympathetic connection between the mental system and the body—between mind and matter, as it were—is recognised, but I do not think that sufficient weight is given by physicians to the importance of this connection. It has been said that the mind sympathises with morbid conditions of all the organs of the body, each, according to certain observers, presenting its own characteristic psychic phenomena—the headache and moroseness of an attack of biliousness, the irritability of temper or despondency which accompany cardiac lesions, and the mental phenomena which are so often associated with phthisis pulmonalis, are all examples of this influence.

Conversely, the mind may be said to act upon the various organs of the body through the great system of nerves, the sympathetic, and more particularly through the vaso-motor nerves, influencing the functions of the various organs and tissues of the body. The increased flow of saliva in sight of a savoury meal, the blush of a modest maiden, and the pallor produced from fear, are all examples of this sympathetic influence, and, it is to be noted, are all examples of mental action upon the circulatory apparatus, increasing or decreasing the lumen of the vessels, and modifying accordingly the supply of blood to the tisues.

The altered vascular condition of these organs—the result of abnormal mental influences—may, if long continued, end in organic change in the tissue. I am not aware that such alteration of an organic nature has ever been found due to this cause, but as regards the circulatory system, collateral evidence points to such influences, of a mental character, producing actual organic change in the heart and vessels, and it is quite reasonable to assume that long continued congestion or anæmia of an organ, no matter from what cause arising, will produce, in time, structural changes in the tissue. Whether the altered circulation be due merely to mental influences of a morbid kind, or whether it be due to plugging of a vessel, or to hypertrophied heart, the results will be the same in the organs supplied.

Considering the grave importance of diseases of the circulatory system, it is surprising that so little notice is taken, in various text books, of the influence they have upon the mind. Admitting that heart disease, *per se*, does produce irritability of temper, moroseness, or suspiciousness in sane persons, it is reasonable to argue that these mental symptoms may gradually become exaggerated until the patient actually becomes insane. That the heart disease produced the insanity in such a case is beyond doubt, but when we have to analyse the manner in which the insanity is produced in such a case, we are beset with difficulties. Whether the psychic phenomena are the result of alteration in the *quantity* of blood supplied to the cerebral cortical cells, or whether they are caused by defects in, or additions to, the *quality* of the blood, or whether, in many cases, both these factors are combined, remains still to be seen.

We were formerly content to ascribe mental derangements, in such cases, to defective blood-supply to the brain, but lately such observers as Mott, Ford Robertson, and Campbell have attempted to prove that it is the quality rather than the quantity of the blood that is at fault; their theory, briefly, is that a toxin is either manufactured by the tissues themselves, or else introduced from without. In either case, the result is the same—a poisoning of the cortical cells concerned in the higher processes of mentalisation. Syphilis and alcoholism may be considered as toxins introduced from without, and the rheumatic poison as a toxin manufactured by the tissues themselves.

This, which may be considered as the toxin theory of the causation of insanity, is plausible enough, and might be made

applicable to other diseases as well as to the insanities, but that it explains satisfactorily the mode of origin of most of the forms of mental disease is very much open to question.

What may be termed the "sane mental symptoms" of a case of heart disease is well known to every practitioner; impatience of control or interference, fits of depression, alternating with periods of irritability, amounting in some cases almost to violence, and even hallucinations of the senses, or delusions, may be found in a cardiac case not considered insane! As Clouston says, it is only when the mental reaction is quite out of proportion to the cause—physical or otherwise—we conclude that the person is suffering from insanity.

I have a patient under my care at present suffering from a "double aortic," who is otherwise perfectly sane, and yet he complains of a peculiar metallic taste in his mouth, and that his room is full of electric batteries and wires that "play" upon him during the night. These mental phenomena only appear when he is very ill and suffering from an attack of cardiac dyspnœa, to which he is liable; at other times, although the cardiac condition is permanent, he is quite free from abnormal mental symptoms. In this case, there can be no doubt that these psychic phenomena are the result of the heart disease, and are produced, partly, at all events, through the agency of the sympathetic system of nerves.

The governing centre for the heart is, as is well known, localised in the medulla oblongata, and is, as has been recently pointed out by Ferrier,[1] in a more or less continuous state of so-called automatic activity, which is capable of being modified by impulses proceeding from the heart itself and blood-vessels, as well as from the higher regions of thought and feeling.

While I have shown how morbid conditions of the circulatory apparatus may give rise to abnormal mental manifestations, it is just as important to recollect that abnormal mental processes may so act upon the circulatory mechanism as to induce temporary and functional disorders of the circulation. Ferrier has shown that influences of a mental or emotional character may modify or disturb the circulation in a perfectly sane individual, as is seen in blushing the result of modesty, and pallor consequent upon a fright.

Such mental or emotional influences upon the circulation

[1] Harveian Oration, *British Medical Journal*, 25th October, 1902, p. 1337.

may be considered as physiological in nature, but, when it is prolonged, or is of a severe character, it may well be considered as pathological, exerting a baneful influence upon the heart and circulation; giving rise, in the first instance, to functional disturbances which, in process of time, end ultimately in actual organic disease. This is not a theory, but it has been proved over and over again.

Benit and Courtier have shown that every feeling or emotion taking its rise within the mind, acts as a cardiac excitant; the psychic change, from one of repose to one of activity, causes vaso-constriction, and increases the cerebral blood-pressure. It may be taken that pleasurable sensations co-exist with vascular dilatation and low tension, while disagreeable sensations are accompanied by vascular constriction and high tension.

When we consider mental diseases it is reasonable to suppose, and is demonstrable, that a long attack of mental excitement, with its increased tissue waste and increased activity of the circulatory apparatus, should so act upon the heart as ultimately to produce hypertrophy or dilatation, and, finally, even valvular incompetence. This statement is directly supported by the facts that, firstly, heart disease occurs more frequently among the insane than among the sane; secondly, that it is noted to develop *after* their admission to an asylum; and, thirdly, that the heart is heaviest, and is most frequently found hypertrophied, in cases of mania than in the other forms of insanity—especially if these cases are of long standing, with prolonged attacks of excitement.

When such observers as Tissot maintained that even simple emotional states may induce cardiac dilatation, which in time may result in hypertrophy, it requires no stretch of imagination to understand how in cases of prolonged acute restlessness and excitement organic disease of this organ may be produced. So long as the nourishment of the cardiac muscle is maintained we need fear no failure of its functions, but in these mental conditions repair of the tissues is at its lowest, and does not counterbalance the enormous tissue metamorphosis, and, accordingly, the heart muscle suffers equally with all the other organs of the body.

The mental symptoms found among the insane in cases of heart disease have been classified by Dr. Mickle[1] under the various forms of cardiac lesion, and he maintained that the psychic phenomena are dependent upon, and characteristic of,

[1] *Goulstonian Lectures*, 1888.

the situation and nature of the lesion. It will, therefore, be of interest if his conclusions are briefly referred to:—

Mitral stenosis.—In this condition the patient is frequently found to be excitable, impulsive, and discontented, having delusions of ill-usage or that his food is being poisoned. He is querulous and most difficult to manage.[1]

Mitral regurgitant.—This disease is usually associated with some depression, together with delusions of suspicion and persecution; sometimes with gnawing sensations in the head; subjects are often morose and of a sullen disposition.

Aortic stenosis.—This condition is frequently found in cases of general paralysis, and in these cases mental failure occurs early in the course of the disease. The patient is usually impulsive and violent, has delusions of persecution, or expresses the delusion that his food is poisoned.

Aortic regurgitant.—The heart in this condition is generally enlarged, weighing from 20 oz. to 25 oz., and this form of heart disease induces sleeplessness and restlessness. Loquacity and excitability characterise the temperament of the patient, who later may express delusions of exaltation, although in the earlier stages depression of spirits is common. Delusions, referable to internal sensations, such as magnetic influences and hallucinations of the various senses, may occur.

Mitral and aortic disease combined.—In such cases the mental symptoms presented are usually those more characteristic of aortic rather than mitral disease. Such a condition is often associated with, or results in, gross brain lesions. The patient is generally dirty in habits, growing rapidly gloomy and demented, and the delusions expressed are frequently referable to the diseased organ, such as that the heart is being eaten away by worms, &c.

[1] In this connection it is interesting to note that the rare mental condition named "Querulantenwahr" by the Germans, where the subject is litigiously inclined, happy only when engaged in a law suit, no matter its nature or its cost, or his power of paying legal fees. So long as these fees are forthcoming, the disease is encouraged by the legal fraternity, and it is only when pauperism results that it is legally recognised as one of insanity. The famous Mrs. Cathcart may be taken as a type of this condition—a mental state associated, according to Griesinger and Kraipelin, frequently with phthisis or mitral stenosis. Whether the cardiac trouble is the actual cause of this mental condition it is difficult to say, but it might be said that it is but an exaggeration of the cantankerousness, querulousness, and resistance to all forms of opposition so generally met with in sane cases of mitral disease.—(*Vide Dict. Psych. Med.*, Hack-Tuke, p. 1061.)

Hypertrophy and dilatation of the heart.—Patients suffering from these conditions are usually morose, depressed, and have delusions of persecution, or that electricity is constantly acting upon them. The mental symptoms are those more of mitral than of aortic disease.

Degeneration of the heart.—This condition gives rise to irritability and restlessness, associated with delusions such as that the subject is being injured, or undergoing persecution. It is common in the later stages of wasting diseases such as phthisis, and no doubt adds to the mental phenomena characteristic of this latter disease.

Atheroma of aortic valves.—Common in the syphilitic variety of general paralysis, and due to the abnormal activity of the heart putting an extra strain on the vascular walls. This cardiac activity, occurring in the early stages of the mental disease, when restlessness and excitement are almost continuous, is followed by great depression as the disease pursues its downward course, together with delusions of suspicion and rapid mental failure. Many of the mental symptoms in this disease are no doubt due to the defective supply of blood to the brain.

Atheroma of the aorta.—A condition common to old age, and the cause of many of the mental phenomena characteristic of this period, and senile insanity. Further, it is a common condition in general paralysis—a disease of the prime of life—and this fact explains the idea some have that general paralysis is simply premature senility. The subjects are at first depressed, but they rapidly become demented, and they are usually affected with paralysis due to gross brain disease, apoplexies being common.

Such, then, are Mickle's conclusions. We have, however, no evidence that his diagnosis in every case was verified by *post-mortem* examination, and it is presumed that his investigations were carried out in his own asylum, which is reserved for males, who, I understand, are mostly soldiers.

The observations which follow were made in Grahamstown Asylum, and the condition of each verified by *post-mortem* examination. I would here note, however, that it is extremely rare finding only one lesion affecting the heart at the autopsy, and it is, therefore, difficult assigning the lesion which may have been the cause of any mental phenomena presented. What has been done has been to consider the most important lesion present, and deal with the mental symptoms in these

cases, and for purposes of comparison the various cardiac lesions have been classified in much the same way as the plan adopted by Mickle in the above observations.

Mitral stenosis.—J. v. B., a male native, was admitted to the asylum on 12th December, 1899—a case of recurring insanity. He was very emotional, restless, talkative, and devoted his energies to preaching, going about all day with a Bible in his hand and a highly decorated hat on his head. He was quiet, well behaved for the most part, and not violent, nor did he express any delusions, but was constantly quoting from the Bible. He died from hepatic abscess; his heart weighed 12½ oz., was large and firmly contracted; the left ventricle was hypertrophied, the mitral valve constricted, and its cusps atheromatous. The organ was embedded in a mass of fat.

Mitral regurgitant.—A., a male native, aged 40, complained of being worried and persecuted by people in the gaol before he came to the asylum. He was a quiet and industrious patient, but expression was noted as furtive, and he apparently had delusions of persecution and suspicion. His heart weighed 12 oz.; there was considerable pericarditis with effusion, the heart muscle was flabby, the mitral valve dilated, and the left ventricle hypertrophied.

Aortic stenosis.—J. R., a male European, aged 66, admitted in a dying condition on 21st February, 1895, dying four days afterwards. It was reported that he had previously laboured under the delusion that people were putting ground-glass in his eyes, and that they, as well as birds and fishes, were torturing him. His heart weighed 13 oz., the aortic cusps were puckered and thickened, the lumen stenosed, left ventricle hypertrophied, cardiac muscle firm, but the heart itself was fatty externally.

Aortic regurgitant.—W. C., a male European, admitted 25th March, 1900; insanity due to syphilis and drink; delusions of persecution, hallucinations of sight and hearing; at times extremely emotional, thinking he was about to die; complains often about his heart, which caused him suddenly to cease whatever he was engaged in for a time. Threatening, although never violent, and this evidently on account of his auditory hallucinations. The heart weighed 23 oz., ventricles enormously dilated, walls much thickened. The aortic orifice measured 2½ inches in diameter, its lining membrane, as well as that of the aorta itself, was roughened and atheromatous, presenting recent ulcerated pits, and spiculæ of calcareous material were

deposited throughout the entire length of the thoracic aorta, which was irregularly dilated in places, giving to its contour an ampullated appearance. The heart muscle was pale and flabby.

Mitral and aortic disease combined.—G. P., a male European admitted 25th July, 1891, and died 23rd October, 1894. He was an epileptic, and had been a hard drinker; thought his relations were plotting against him, and that his food was poisoned; hallucinations of most of the senses, restless, violent, and incoherent. Rapidly became utterly demented. The heart was large, weighing 15 oz., fatty externally; the left ventricle thickened; both aortic and mitral valves were atheromatous and constricted.

Hypertrophy and dilatation of the heart.—While hypertrophy of the heart alone is a rare condition without some valvular lesion, a case illustrative of this condition chiefly may not be without some interest, as it is possible that the size of this organ was the main factor in the mental phenomena exhibited.

C. P., a male European, aged 56, admitted 17th November, 1899; cause of insanity, drink, with strong hereditary predisposition, his father being insane. Speech, slow, hesitating, and jerky; hands shook as if he suffered from "palsy;" and he had delusions of great personal strength, which later developed into ideas of enormous wealth; he was childishly satisfied with his position, and was constantly falling in love with one or other of the nurses. He died suddenly from cardiac failure; the heart was found to weigh 18 oz., the aortic valve was diseased, the left ventricle much hypertrophied, and the heart muscle pale and flabby.

A *dilated heart* was found in the case of an epileptic dement, addicted to masturbation, who died suddenly. The organ weighed 13 oz., all the chambers were dilated, and much fat was found externally.

Atheroma of the aorta.—This condition I frequently found in syphilitics, and is closely associated with aortic valvular disease. In the following case the atheroma extended along the course of the aorta to a considerable extent. The patient suffered from melancholia, with suicidal tendencies; he believed he had lost his wife, his property, and all his family, that he had committed a serious crime, and that he was eternally lost. He was clean and tidy in appearance, and of considerable mental and intellectual development.

Pericarditis.—This condition of the heart is not referred to

by Mickle, but I found it in several of my cases, both alone and associated with valvular—chiefly aortic—disease.

A., a native male, aged 60, admitted 13th August, 1892, and died 25th September, 1892, from pneumonia and cerebral softening. His habits were dirty, he was paralysed, and mentally he was utterly fatuous and demented. The pericardial sac contained an excess of fluid, and the parietal and visceral walls were glued together by extensive and recent adhesions. Another case of pericarditis was found in a female, who was noted to have been dirty in habits, quarrelsome, conversation incoherent and rapid; dementia rapidly supervened. This patient had rheumatic fever some time before her death. The pericardium was found enormously thickened and adherent to the heart, and the sac contained an excess of partially organised fluid.

Such, then, are the mental symptoms and pathological appearances of cases that have died with cardiac lesions, and, to briefly summarise the information thereby obtained, we note that in mitral disease, whether it be obstructive or regurgitant, certain symptoms stand out prominently. The patients are usually excitable and impulsive; in some, delusions and conduct pertain to the religious, or that their food is being poisoned, or they are being persecuted. While actual depression seldom exists, the patient tends to become suspicious of his surroundings and his friends.

In aortic disease, when the valves are affected, the excitement amounts to violence at times. Dementia rapidly supervenes in cases of stenosis, owing to defective cerebral blood supply. A period of depression is common between the excited and demented stages. Delusions of persecution, food being poisoned, and referring to the diseased organ, as well as hallucinations of any or all of the senses, especially those of seeing and hearing, and occasionally of taste, may exist.

When both the mitral and aortic valves are diseased in the one patient, the symptoms are those, first, of great restlessness and violence, lapsing soon into dementia. The early stage may present delusions of persecution and poisoning of food; towards the termination of the disease, usually by apoplexy, the patient becomes dirty and depraved in his habits,

Hypertrophy of the heart is generally associated with delusions of great physical strength, which shortly ends in simple complacent and childish dementia. In dilatation of the

organ, the subject was noted to be emotional, had a suspicious expression, and the habits were dirty.

Atheroma of the aortic valve and the aortic lining membrane are common to general paralysis, as well as to ordinary old age; how far the existence of aortic atheroma influences the mental manifestations of these conditions it is difficult to say. My experience agrees with Mickle's, that the presence of atheroma in general paralysis certainly shortens the duration of the disease; and, therefore, syphilitic general paralysis —where atheroma is usual—is of much shorter duration than the non-syphilitic type, for I still hold that this disease exists, and that general paralysis can develop in a non-syphilitic subject.

In conclusion, it may be stated that we are hardly yet justified in ascribing any one mental symptom, or any one set of mental symptoms, to each of the cardiac lesions we meet with, and a perusal of Mickle's and my observations show that there is a tendency to repetition of symptoms when each of the cardiac lesions are considered; but this uniformity in the character of the mental manifestations in cases of heart disease is interesting, and we note that those associated with lesions affecting the right side of the heart give rise to symptoms of restlessness and excitement, and those referring to the left side to suspiciousness, followed by depression and dementia.

It is further interesting to note that these mental phenomena are merely exaggerations of the frequently observed mental symptoms of sane persons suffering from heart disease; and it is an interesting study, in the development of delusions, watching the gradual passage of what may be termed sane mental phenomena into what are actual insane symptoms, showing that the difference existing between the two is one of degree only, and not one of kind, as is said by most medical observers.

And here, to practical physicians, we have a hint as to the treatment of those mental phenomena which are due either to defective blood supply to the brain, or else to the accumulation of impure blood within the cerebrum. Dr. Clouston, in one of his recent annual reports, noted the prevalence of cases of heart disease among his patients, and referred to the beneficial effects of digitalis in such cases, allaying their restlessness, and inducing sleep in the sleepless. The drug undoubtedly acts as a powerful stimulus to the cardiac contractions, and thereby assists nature in flushing out the vessels as it were, propelling

pure blood through the cerebral arterial system, and thereby displacing the impure within the same channels. It is, indeed, this theory that guides us when we use digitalis as a sedative or hypnotic in asylum practice.

Finally, with the evidence before us that there are certain mental symptoms which are characteristic of cardiac disease, and that these symptoms are the result of the heart lesion, I maintain that we are justified in recognising heart disease as one of the important and direct causes of insanity, and that, in any future classification of mental diseases, heart disease is entitled to the same position as phthisis pulmonalis, ovarian disease, and many other somatic causes, and it is claimed for it that the designation "insanity of heart disease" should be used when this well-marked series of mental phenomena are discussed. These mental symptoms are so pathognomonic of heart disease that, when found, we are justified in ascribing them to a morbid condition of the vascular system interfering with the satisfactory nourishment of the brain and its delicate functions.

GLASGOW: PRINTED BY ALEX. MACDOUGALL.