

*On the Physiology of General Paralysis of the Insane, and of Epilepsy.* By GEORGE THOMPSON, L.R.C.P. Lond.; Medical Superintendent of the Bristol Lunatic Asylum.

In the first and second volumes of the West Riding Asylum Medical Reports, 1871-72, there appeared two papers bearing my name, which were entitled, the one "The Sphygmograph in Asylum Practice," and the other "The Sphygmograph in Epilepsy." The first paper, besides containing a few general remarks, was, however, confined to the study of the physiology of General Paralysis; the other, as its name implied, referred entirely to certain phenomena observed in Epilepsy, and contained a few speculations as to the origin and nature of these phenomena. Both papers had been hastily prepared, though they really represented an amount of patient labour such as probably I shall never undertake again. The later one had also the disadvantage of being so cut and mutilated for want of space that, when finished, I hardly recognised my own work. I had begun to think that they were to be considered of no real value, and only fit to pass into the limbo of forgotten things, when they were suddenly snatched from a threatening oblivion by having assigned to them a prominent place in the new edition of the work so familiar to many engaged in this special branch of medicine by the names of Bucknill and Tuke. More recently they have been brought into further prominence by being incorporated into that clever, thorough work, "The Pathological Anatomy of the Nervous Centres," by Dr. Long Fox, where the views originally advanced by myself are put in much clearer and more forcible language than I could ever master. It has occurred to me, then, that now is a good opportunity for considering *de novo* the bearings which these speculations may have on the further elucidation of the nature of the origin of two diseases, one of which, at least, has hitherto been enveloped in darkness, and which, because of such ignorance, has, until recently, baffled all attempts to effect anything like a certain cure.

I may be permitted to say here, that I have long been convinced, that, in endeavouring to find out the true nature of the cause of any disease, or even of the disease itself, by examining the condition of the parts involved after death only, we begin at the wrong end—though I would be loth to say that time so spent was utterly wasted

—and that, if we would have reliable facts upon which to base our theories and practice, such facts must be the result of observation upon the living, rather than upon the dead, subject. This much should be said, however, in support of those indefatigable workers, the microscopists, that until the invention of the ophthalmoscope and the sphygmograph, and the adaptation of the thermometer to the physician's wants, there was no other instrument than that one upon which they built their hopes. But I may possibly be pardoned if I ask here, what has the microscope done for the elucidation of disease which, more frequently than not, is only a manifestation of perverted function? This instrument may enable us to make out "disseminated molecular degeneration," "proliferation of cellular tissue," or "fatty decay," but does it carry us any farther? The more I think of the negative results which follow the use of the microscope, the more do I think it is an instrument much overrated as to its value as an aid to the proper study of those subtle influences which are at work in the origin, or through the course, of any given disease. On the other hand, the other three instruments I have named—to which, of course, should be added the stethoscope—enable us to see disease when it really exists, and not merely the results, when it has done its deadly work.

The remarks which are to follow I propose to devote, in such proportion as may be necessary, to the consideration of the two diseases named at the head of this essay; and if I refer to conditions found after death, it will only be for the sake of assisting to make clear the arguments which will be advanced as being the result of observations made during the life of the individual.

General Paralysis is the subject for consideration first; and here I will remark how much encouragement is given in the account of the cure of two cases, even far advanced when first subjected to treatment, as told by Dr. Crichton Browne in the "*British Medical Journal*" for October 24th, 1874. It must be borne in mind that until recently the cure of General Paralysis of the Insane was a thing unthought of; now, it is a stern reality!

The tracings made by the sphygmograph, inserted into my first paper, were all original except one. They are, for the most part, reproduced in the "*Manual of Psychological Medicine*," by Drs. Bucknill and Tuke, and may there be easily referred to. The tracing I had borrowed was taken from Dr.

Carpenter's "Human Physiology" (7th Edit.). The tracings are illustrative of the arterial condition in health, in pyrexia, in a state of chill—say after the individual had been exposed to a cold-water bath—in general paralysis, with no treatment, and in the same disease after treatment by Calabar Bean.

In some critical remarks on my first paper, which appeared in the "Journal of Mental Science" of January, 1872, the reviewer, while according to me the credit of possibly being the means of clearing up a question which was then involved in obscurity, charges me with having shown some tendency to look for facts to fit theories. This sort of criticism is always cruel in itself; but when I remembered that I had all the facts staring me in the face long before I had discovered in my mind a single theory, and that had it not happened that I had stumbled over the tracing of Dr. Carpenter, which had been taken from a "chilled" individual, I should probably never have troubled the world with either fact or theory, I felt, for once in my life, how bitter sarcastic abuse may be. This time I shall be so bold, then, as to give my theories first, and then to bring forward such facts as I may deem necessary for the support of those theories.

*The Theories.*—I use Dr. Long Fox's words and my own. (1.) That the organic change which exists in the very early stages of General Paralysis consists of a diminished calibre of the vessels, which is of the nature of a persistent spasm. (2.) That this spasm, though persistent if left untreated, is, if recognised early, amenable to remedial means. (3.) That the lesions found after death are not the cause, but the result, of early organic changes that need be only of temporary duration.

*The Facts.*—(1.) That the tracing of the pulse taken at the wrist by the sphygmograph in cases of General Paralysis, when untreated, is precisely similar to that found in a person in good health who had been exposed to a cold bath for the space of one minute. (2.) That the vessels of the retinae and optic discs are thin and attenuated, and the discs themselves are void of their natural pink tint. (3.) That General Paralytics are more frequently the subjects of cerebral syncope than persons labouring under any other disease of the brain. (4.) That in the early stages of General Paralysis the temperature of the body is lower than in health, and the skin of persons so affected is then in that condition known as the *cutis anserina*, resembling that condition

seen in the cold stage of ague, in cholera, or in the rigors preceding a febrile attack. (5.) That by the administration of such remedies as are known to be antagonistic to spasmodic action, the pulse-tracing may be brought back to a healthy form, the natural appearance of the retinae may be regained, the temperature of the body may be raised to the normal standard, and then the skin will assume its original smoothness.

It will be seen, then, that the facts, in volume at least, far outweigh the theories, which may now be considered *seriatim*. To do this the more effectively, however, the facts should be taken with the theories.

The theory of persistent spasm is based upon the uniform appearance which is obtained in the pulse-tracing taken in the early stages of general paralysis. The tracing is such as is always found when the individual is exposed to such means as are known to produce spasm of involuntary muscular fibre. These means are the application of cold to the surface of the body, the administration of ergot, atropia, bromide of potassium, and lead. In treating epilepsy by means of the three drugs first named, I have frequently produced a tracing such as is found by Dr. Carpenter after the application of cold, and by myself in general paralysis when untreated. M. Lorain has published tracings taken in lead-poisoning which very nearly resemble Dr. Carpenter's and my own just referred to. All recent writers on lead-poisoning, attribute the colic found in this disease to spasm of the muscular substance of the intestine, and many of them attribute the nervous symptoms so general in this disease to wasting of nerve substance, or rather to ill nutrition of the same. Dr. Swaine Taylor says that "after death the large and small intestines are found much contracted." Dr. Aitken says that "the morbid appearances in the brain and spinal cord are generally such as denote imperfect or depraved nutrition of these centres." Dr. Ringer says that the bloodvessels are subject to cramps, like other parts of the body; and Dr. Garrod says that lead produces a smaller pulse. According to these authorities on therapeutics, the same occurs in poisoning by ergot of rye; the action of this drug upon the uterus—the involuntary organ *par excellence*—is too well known to need more than a passing remark. These observations will, then, make clear the reason why the pulse-tracings found in the several conditions should so strongly bear a family likeness in common with the tracings found in the disease more immediately under

our consideration. My friends, Drs. Allbutt and Aldridge, though they differ in some minute particulars, are agreed as to the condition of the retinae and optic discs as seen in general paralytics. This condition is one of arterial contraction as a rule, but occasionally a hyperæmic condition is found. As I proceed, I may give a reason for this latter condition. But in looking through the tables given by Dr. Aldridge in the second volume of the "West Riding Asylum Reports," it will be seen how frequently, in fact, how generally, the term "arteries very small and not numerous," or its equivalent, occurs. The temperature of general paralytics has been said to be lower than in healthy persons. Dr. Macleod, whose observations are quoted by "Bucknill and Tuke," shows that this is invariably the case before mid-day. He shows further that there is generally a rise after dinner. I will speak further of this by-and-bye. As to the condition of the skin, I need only appeal to the experience of those under whose notice cases of general paralysis frequently come, for confirmation of my statement.

The next theory refers to the remediability of this disturbance of function, which I have ventured to call spasm. And here I will revert to the occasional hyperæmic condition of the optic apparatus, and to the rise in temperature noted after mid-day. I think it will soon be seen that the whole mischief lies in a "nutshell," which is *vascular hypersensitiveness*. In making some sphygmographic observations on one man, a general paralytic, I recently found that while, as a rule, the tracing denoted vascular spasm, it was only necessary to give him a half-pint of moderately strong beer—the ordinary asylum beer—to produce the tracing which is usually found in pyrexia. In other words, I was able by such a simple means to change the tracing from being polycrotous to the typical dicrotic one found in fever. Here, then, was new light and good reason for further speculation. I naturally turned to the thermometer. At the first tracing taken, then, on a subsequent day, when the usual polycrotic sphygmogram was found, the temperature stood at 97° Fahr. Half an hour after the administration of the usual dinner allowance of beer, when the fever tracing was again found, the temperature stood at 98° Fahr. I have repeated this experiment subsequently on the same man, and on other patients, with nearly the same results. Here, then, we see such a state of sensibility as is far from normal, and if over-dilatation is so easily produced, it may naturally be asked does the reverse

ever occur? To this we have the reply in the occasional occurrence of cerebral syncope referred to under the head of the third "fact." This condition, I think, assumes what is known as "shock," and in my experience generally occurs after a sudden distension of the stomach. Two days before writing this, my attention was called to a female general paralytic, who was then in an alarming state of syncope. Before any stimulant could be got at, she vomited a large dinner, just taken, and then rapidly recovered. Experience of this nature must be common to all engaged in this special department of medicine. Arterial spasm, then, may be regarded as amenable to treatment.

With regard to my third theory, I will begin its consideration by quoting the words of Dr. Long Fox,\* who, after enumerating with other causes a "variation in the normal blood supply to the brain" as being one sufficient cause, says, "Each of these, if long continued, or frequently repeated, will induce structural lesion that can be recognised after death; each of them may be the starting-point of phenomena of a severe character, and if the duration of the attack be not protracted, will leave no *post-mortem* appearance. Still the lesion is present during life." Again, in speaking of the doctrine of persistent spasm of the vessels as being the primary cause of tissue changes, Dr. Fox says, "This is an illustration of a morbid condition that at first would leave no recognisable structural results; but it would be wrong to say that the early symptoms of general paralysis were not connected with organic change. The organic change is in the diminished calibre of the vessels, which not only persists, if left untreated, but will lead to further lesions; whilst, if recognised early, it is amenable to remedial means, at least for a time." How much stress is laid by different writers on the functions of the nervous system, upon the need for a steady and an equable supply of blood, I need hardly relate. Dr. Carpenter† tells how the *recording* process ceases when nutritive changes in the brain are impaired; and further, that the *potential* energy laid up in store by nutritive action is converted into *actual* energy, by the oxygen supplied through the medium of the blood. Herbert Spencer‡ tells how the nerves and nerve-centres act only so long as they are furnished with those materials which the blood vessels bring

\* "Pathological Anatomy of the Nervous Centres."

† "Mental Physiology."

‡ "Principles of Psychology," Vol. i.

them. The same writer also lays much stress upon the importance of the vaso-motor apparatus as a means of regulating the blood vessels so as to subserve general and local needs. But these are for the most part but rudimentary ideas, which must have been long familiar to all.

In what disease more than all others do we see undoubted evidences of mal-nutrition as that now under discussion? In no disease, unless it be that known as senile dementia, do we find the "*recording process*" so feeble, or so nearly, if not entirely, absent. The general paralytic, when in an early stage of the disease, is known before all other symptoms by forgetfulness, not of things long past, but of recent events. He neglects his business; he becomes careless as to matters which otherwise would be of supreme importance to him; his affections are blunted; his morals perverted. It may be that for some time to come the *potential* energy spoken of by Dr. Carpenter exists in abundance, but the power imparted to the brain by a rapid flow of healthy blood—*actual* energy—is not called into existence—and why? because the brain is blanched; it is deprived of the elements of nutrition.

It will be asked, however, what is the cause of this arterial spasm—this blanching of the nervous system? To this I reply—a heightened susceptibility on the part of the vaso-motor system to such influences as are likely to affect it. Happily this extreme susceptibility does not exist, except in the few; nor does it always lead to the introduction of the terrible malady we are considering. The case of wild excitement, recorded by Dr. Sutherland,\* in the person of an officer in the army "up in town on a spree," is an instance of "hypersensibility;" but one would hardly venture to say that such a case would terminate in general paralysis. But no drug brings out this feature so powerfully as alcohol, and this hypersensibility is very common in the insane. Watch the effects of dinner upon the insane where beer is an article of diet. The lively become morose, and the morose lively. One of the cases where death ensued after a small dose of chloral, when I held office at the West Riding Asylum, was that of a man who, after a single glass of beer, became "fearfully flushed," as the attendants said. The heightened susceptibility takes the form then of alternate over-dilation and over-contraction—of over-stimulation followed by a

\* "Brit. Med. Journal," Nov. 14th, 1874.

reaction. But the reaction becomes a persistent condition. The paralysis of the sympathetic, causing dilation, becomes an irritation, causing persistent contraction: this persistent contraction prevents the rapid flow of the blood so essential to the nutrition of the brain, and the phenomena known as brain-wasting are the result.

One other fact pointing to arterial contraction in general paralysis. Dr. Wilkie Burman,\* says in his article, "Heart Disease in Insanity:"—"The mean average weight of the heart is considerably greater in general paralysis, and in chronic or consecutive dementia (disorganisation of the brain) than it is in other individual forms of insanity." The reason is sufficiently obvious. The heart has become hypertrophied through the powerful efforts it has made to send on the normal supply of blood, such efforts being rendered necessary by the absence of dilatibility of the vessels.

*The Remedy.*—The cases must be recognised early. Dr. Sherlock and (I think) Dr. Duckworth Williams relate how they have reason to place no confidence in the Calabar bean which has been proved of such efficacy in other hands. But they made this mistake—they used it when the disease was too far advanced. Bring to me a case such as those described in the Worcester and Sussex Asylum Reports, and I will tell you that they possess no interest for me. These gentlemen gave the Calabar bean during excitement. That is just the time when I omit it. I have often given the drug until excitement and occasionally an epileptiform seizure have been brought on. But then I stop its use—for a time, at least. I have not such confidence in the use of Calabar bean as Dr. Crichton Browne has, but in my hands it has answered all reasonable expectation. I daresay the day is not far distant when the real remedy will be known. In the meantime, the Calabar bean, in properly-selected cases, will be found to be the best—I think I may say, the only—remedy the pharmacist can provide us. Whatever it may be, the remedy must be one which will remove that over-sensibility of the arterial portion of the vascular system.

\* West Riding Asylum Reports, Vol. iii., 1873.

(*To be continued.*)