The connection between certain cardiac diseases and cerebral affections

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James Clement
The connection between certain Cardiac Diseases and Cerebral Affections.

The connection between Cardiac and cerebral Affections is a subject not only of a very extensive and obscure nature, but likewise one of the highest practical importance, in pointing out the pathology of these diseases, as well as interesting and instructive in regard to the laws of Physiology.

This subject has at one time or other undergone a very considerable amount of investigation by many able and experienced Pathologists. The conclusions however to which they have come are in many instances not only obscure, but also of a very conflicting and diversified nature, such as we know to be of common occurrence in the greater number of researches which have taken place in subjects connected with Physiology.
and Pathology, but more especially those cases in which we find the nervous system to be involved. The views, in the whole, implicating the consideration of this subject, are becoming of a more clear and unanimous nature; but yet we shall find much proof and explanation required from many of those authorities before their theories can be looked upon and received as correct or decisive.

The relation in which Hypostrophy of the Heart bears to apoplexy has undergone more consideration by modern Pathologists than any other part of this subject. The general conclusion came to, and the one still very frequently received, we shall find, in the course of this paper, to be unsupported by facts and inconsistent with the true Pathology of the disease.

It is wholly unnecessary here to make any remarks in regard to the cerebral circulation, a point now pretty clearly made out by the researches of Monro Secundus and Dr. Kelie of Leith. He
shall briefly refer to the different medici
through which the connection between Cardiac
and cerebral affections may be explained.

First. Through the medium of the circula-
tion. Thus, when the Heart acts violently,
the blood must be driven with greater
force into the vessels at the base of the
brain; and exert a greater pressure on
the inner surface of the vessels, and
consequently also upon the substance
of the brain.

Second. Through the medium of the nervous
system. Although experiments have
failed to prove that the Cardiac action
is directly governed by the power of
any part of the brain or even spinal
cord, yet we must allow an indirect
or occasional influence exercised by or
through the brain upon the movements
of the Heart. This influence is proved in
a much more striking manner by the
phenomena of disease than by any
experimental or other physiological obser-
vations. The effect of mental emotion tos
upon that organ, is so familiar to every individual, that in common language the heart is regarded as the seat of many of the emotions and passions. Thus, the heart's action is increased and said to leap from joy; it palpitates from anxiety; becomes irregular, and is even sometimes entirely arrested from terror, and is depressed by grief and despair.

These two onedia are the chief thru which we are able to explain the connection between the Heart and Cerebrum. There is however another mode in which disease of the Heart and Brain may be said to be connected as much as simultaneous disease affecting these two organs is not unfrequently the result of the same cause. Thus, in anemia we may have palpitation and hypertrophy of the Heart induced, while at the same time softening of the Brain may ensue from the depraved nutrition. Again, the same departure from the normal nutrition which tends to calcareous degeneration of the cerebral vessels, predisposing...
them to rupture also inclines to calicular disease of the heart with the Aorta, leading to hypertrophy of that organ.

It is through one or other of these modes just stated that we shall be able generally to make out the connection between Cardiac and Cerebral disorder.

Owing to the extensive nature of this subject we shall not be capable, in a paper such as the present, to treat of it as it ought to be done, and consequently we shall merely refer to some of the more important disorders connected with it.

First. We shall consider a peculiar form of Pericarditis in which there is latency of the ordinary symptoms while others are present which display all the characters of inflammation of the Brain.

Secondly. We shall treat of the connection between Fibrous deposits on the left side of the Heart and cerebral softening, depending on obstruction.
in one or more of the cerebral vessels.

and at the same time consider the

validity of the doctrine recently

brought forward by Dr. Kirkes of

London.

Thirdly. We shall make some observa-
tions on Hyper trophy with valvular
disease of the left side of the Heart
as related to cerebral affection.

and

Fourthly. We shall briefly consider the

connection between fatty degeneration
of the Heart, and the peculiar

cerebral phenomena witnessed in

that disorder.
I. Acute Pericarditis with cerebral disorder.

In the few remarks we are about to make on Acute Pericarditis, we shall in the first place state the characteristics of the cerebral symptoms which in some instances complicate this disease, causing it to assume a masked and almost always fatal character. Secondly, we shall give the views entertained by the different authors who have attended to this subject, regarding the connection between the cerebral phenomena and the Pericarditis at the same time make what remarks may seem necessary in regard to the views of these different authorities, and lastly, offer an explanation of the subject which appears more clear and rational. The cerebral symptoms which sometimes complicate Pericarditis may appear under very varied and different forms, such as one or more of the following: viz. Headache, disturbed sleep, frightful dreams, delirium, epileptic convulsions.
Aphlegmatism stupor, imperfect hemiplegia, a quasi-maniacal state or actual mania of violent character with fatal coma. Dr. Burnet informs us that there is probably an affection of the cerebro-spinal system, which may not be produced by inflammation. Diseases of the heart and its membranes. The head symptoms in certain cases are so severe with so little obvious cardiac disease that they have been refused by more than one physician of considerable experience to inflammation of the brain and its membranes; and were treated accordingly, while not until after death was the true nature of the case detected. In the greater number of such instances, the brain was found to all appearance healthy and no other lesion observed to which the symptoms could be ascribed except Acute Pericarditis. The earliest recorded case of this nature is one detailed by Mr. Gunby.
in 1817—Dr. Abernethie, in 1820, communicated
a nearly similar case to the Medical Chir-
surgical Society of Edinburgh, concerning which
he observes, "A remarkable circumstance"
in the history of this dangerous affection;
"it is, that it may be going on rapidly
yet insidiously, while our attention is
occupied by symptoms which have no
relation to it." Dr. Latham we find to
be the next who called attention to
this form of cardiac inflammation,
predatory obscure and deceptive through
the cerebral symptoms. Since that time
many other Authors of considerable note
have recorded analogous cases.

Dr. Hope in his elaborate treatise
on Heart Disease, informs us, that these
cases of Pericarditis simulating inflam-
mation of the brain are very rare; it
is remarkable that this Author with
his insomniating attention to disease of
the heart, never met with a single
instance in his whole experience. It
is very probable that many cases may be met with and their true nature not discovered, unless a strict and searching post-mortem investigation be obtained. Dr. Durrow in his remarks concerning this peculiar affection states, that such cases are of more frequent occurrence than is commonly supposed. Several cases having come under his direct observation. Dr. Taylor, who has lately made extensive and direct investigations into this disease and whose authority assuredly merits a considerable weight of respect and confidence, has had the opportunity of examining and recording a case of this particular character. The general symptoms seen by him, besides epilptic convulsions, were frequent tremors in the legs and arms, delirium, confusion of mind and finally stupor, ending in fatal coma.

With respect to the nature of the connection between the cerebral symptoms and the cardiac disease, very few authors appear...
appear to have formed any decided or clear view.

Dr. Taylor in presenting his opinion on the subject attempts to show that the central symptoms and the pericarditis are independent of each other, and that they are the common effects of the renal disease which existed in the case examined by him. The proof which he gives us for such an explanation is as follows—

First. There had been crampe and occasional fits of memory before the pericarditis appeared. This disease therefore could not be the cause of the symptoms in question. Second. The coma and other recent nervous symptoms would all have been relieved without hesitation to the pericarditis disease which existed in the case, if no pericarditis had been found.

Third. He endeavours to show that the mass of cases of non-rheumatic pericarditis is due to renal disease.
of the cases of non-pneumatic Pericarditis is quite latent in the ordinary acceptance of the term, and also that the mortality is much greater than among the cases of pneumatic Pericarditis.

Consequently this Author regards the coma and cardiac disease in this peculiar affection as the common effects of a renal disorder, and wholly independent of each other. With due regard then to Dr. Taylor's view it seems most plausible so far as the case which has Come under his own observation is concerned, he adheres however too closely to the nature of that case, and disregards or doubts the accuracy of the other observers, who have recorded several cases of rheumatic as well as idiopathic Pericarditis complicated in the manner alluded to, and where no kidney affection could be detected. Dr. Taylor in attempting to uphold his opinion against such cases states that in no one of them has the plate of the kidneys after death been...
been expressly mentioned, and the presence or absence of albumen in the urine been noted during life. Although such has not been, we allow, directly stated, yet it comes much to the same thing, when we are informed that there was no morbide appearance in any other organ than the Pericardium, and we can never allow ourselves to suppose that so many distinguished Authors, under whose care those cases occurred, could have been so misled in their diagnosis and so inaccurate in their post-mortem examination, as to pass without notice such a prominent affection of the kidney as Bright’s disease.

From these remarks then it must be obvious, that Dr. Taylor’s view is one which is wholly erroneous, and devoid of anything in the form of proper evidence to substantiate and establish it.

M. Builland in reviewing the general symptoms of Pericarditis advent to the extraordinary disturbance of the previous
previous system in some cases, and proceeding to analyze the peculiarities which distinguished them, comes to the conclusion that Complicated pleurisy is to be attributed as the Cause of the nervous phenomena. He finds that such nervous symptoms have occurred when Pericarditis has been Co-existent with pleurisy, and especially with exclusive, diaphragmatic pleurisy. This opinion he supported by some of his own cases, and one recorded by Serviant, as well as that of the celebrated republican Hindeau, who died of severe Pericarditis complicated with pleurisy. The progress of his Complaint was accompanied with the most distressing nervous symptoms which caused him frequently to appeal to his philosophic friend and Physician Sabard, to put an end to his agony by large doses of opium. This explanation of Mr. Boillaud's in regard to the pathology of these Cases of Pericarditis with aggravated and fatal Symptoms of nervous excitement will

Sincerely
peurally bear a strict review. We find recorded in his own work the details of both fatal and favorable cases of pericarditis complicated with pleurisy, showing that such cases are not necessarily attended with nervous excitement. Many cases of rheumatic pericarditis complicated with pleurisy exist, where none of the central symptoms show themselves, on the other hand, cases of pericarditis are recorded where no pleurisy existed, and which were characterized by these strange nervous phenomena. Suffice it then to say that Dr. Bouilland's view of complicated pleurisy being the true cause of the central symptoms is incorrect, and stands in want of evidence to make it anything like conclusive.

Dr. Howell in his treatise on this subject informs us, that having collected a considerable number of such cases, having detailed and analyzed them with every possible care, he considers that all
Those groups of symptoms which indicate the most-formidable diseases of the brain, may arise from irritation of the nerves of the heart and its membranes, without any structural change in the nervous centre itself.

It appears most evident that Dr. Burtons has given us a very inadequate explanation of this subject, he does not in the slightest refer to the reason why irritation of the nerves of the heart does not in all cases produce these formidable cerebral symptoms. Irritation of the nerves of the heart is of frequent occurrence, but these strange cerebral symptoms are of rare occurrence — We must then look upon this explanation of Dr. Burton if not unsound at least very defective.

On the whole then, it is very obvious that the views given by those different Authors are very deficient, valueless and un instructive, in their attempted elucidation of the nature of the Connection between
Sweating conclusion! When compared with authors having a little doubtful as to its being
between the Cerebral disorder and the pericardites -

The only apparently feasible explanation of the subject must be to consider the Cerebral symptoms as resulting from irritation of the nerves of the heart, whilst the system labours under a certain requisite predisposition. That there must be a predisposition is evident from the very few number attached of those exposed to the exciting cause, viz: irritation of the nerves of the heart. As to what that predisposition consists in, it at present unknown. There is no doubt however but, that if a proper opportunity was afforded, something might be detected either inherent in the previous state of the system, or produced in the course of the disease, which acts as a predisposing cause. The opportunities however for investigating this particular form of the disease, are unfortunately very rare.
In support of the preceding explanation it appears to be quite as probable and as possible that irritation of the nerves which lead to the brain, and consequently those of the heart, should under a certain predisposing state of the system, produce symptoms resembling inflammation of the brain, as that irritation of nerves which pass to the spine, should under a certain predisposing state of the system, produce symptoms resembling inflammation of the Spinal Cord, such as takes place in Symptomatic Disease, while no trace of disease can often be detected in that structure. The analogy so far as we have laid it down is obviously quite rational. The probability of this view is further strengthened when we consider the normal connection between the brain and heart, which is explicable by means of the sympathetic system of nerves and the Cardiac branches of the Hypogastrum. We have only then to consider the
the irritation of the Cardiac nerves, under a certain state of the system, to be conveyed along these nerves to the Brain, and there produce all the symptoms of irritation in that organ which we have already mentioned.

How far the preceding view upon a more able and strict investigation may appear correct, we do not pretend to say; it is seemingly however quite consistent with the nature of the disease, and with the laws of Pathology.

Besides being interesting in a pathological point of view, it must also be of the greatest practical import. We can very readily imagine how simply a pad error in diagnosis might occur, when we consider the prominent urgent and fatal appearance of the Cerebral symptoms, and the almost patent character of the pericarditis. The state of the heart, then, should in all cases of apparent Cerebral disease be examined, and
and by so doing afford our patient every opportunity to recover and at the same time prevent a blot upon our reputation, with which respect to the treatment we have merely to say that it must be directed towards the Pericarditis. General along with local blood-letting, followed by Colonel and Opium, seems to have been attended with the most benefit. Of fourteen cases detailed by Dr. Burrow, four only escaped with their lives, and of these three were treated on the colonel, and opium plan, combined with the abstraction of blood. Of the remaining eleven the greater number doubtless received the treatment applicable to cerebral affections.
The connection between Fibrinous deposits on the interior of the left side of the Heart and Cerebral Softening.

In treating of this part of the present subject we shall chiefly confine our views to the consideration of the doctrine recently brought forward by Dr. Virkes, in which he concurs and attempts to prove that cerebral softening with other organic affections of the brain may and do result from the detachment of fibrinous deposits on the interior of the left side of the heart, and their mixture with the circulating blood. This doctrine to a certain extent has been very generally received, yet upon investigating the subject, it must be obvious, and from the remarks we intend to make we think it will appear that so far as his evidence goes to substantiate his views, much more is required before they can be received as conclusive.

It is not requisite that we should in this paper enter into the many and conflicting discussions that have been published regarding the origin of these fibrinous deposits...
deposits found on the interior of the heart. Sufficient it is to say, that the most recent conclusions come to, and the one most frequently received by pathologists, is that fibrous concretions of large size are never the absolute result of an occlusion from the lining membrane of the heart, and that they are therefore direct and true deposits from the blood. That these deposits do exist on the interior of the heart and surface of the valves during life, we may admit as being beyond a doubt. And that they are frequently seen after death to be more or less firmly adherent, is a fact scarcely requiring to be mentioned to medical authorities in these days. These formations present innumerable varieties both in form and magnitude, from mere granules of crude lymph to large irregular cauliflower excrescences projecting into the interior of the heart from the surface of the valves. Their mode of attachment ranges between that of a broad base and a mere pedicle.

Dr. Virkes informs us that out unfrequently
infrequently lumps of old laminated fibres, or even considerable magnitude are found quite loose in the cavities of the heart, having probably dropped off before death - and sometimes a mass of nature may be found some distance along the aorta or pulmonary artery. We are also informed by the same author, that fibrous deposits are often seen loosely attached, and capable of being detached and set free by the circulating fluid, and being set free they are exposed to the consequence of being carried along with that fluid and stopped at the first vessel too narrow to allow of their transit. We are apt to suppose, from the size of the vessels leading to the brain, and from their relation to the propelling force of the circulating fluid, that these vessels are peculiarly liable to plugging from such a cause. In order that the cerebral vessels be thus subject, we consider the clots as coming from the left side of the heart - where they are most frequently found. The consequence of such an obstruction must
be so diminished as entirely cut off the supply of blood normally sent to that part of the cerebrum by those vessels, this we are aware gives rise to disturbance or arrest of function in the part with subsequent softening or disorganization and frequently more or less hemiplegia on the side opposite to that in which the obstruction had taken place. These results from a diminution in the supply of blood sent to the brain are well illustrated by a case recently published in the Medical Chirurgical Transactions of London by Dr. Todd in which syncope followed by hemiplegia and softening of one side of the brain resulted from the sudden formation of a dissecting aneurism of the Aorta innominata and right carotid arteries whereby the current of blood along the carotid and vertebral arteries was all but completely arrested.

Dr. Forbes throughout his investigation on this subject has provided us with the history of a considerable number of cases in which obstructions from deposits of plaque on one or more of the cerebral
Vessels was attended with the results just mentioned, while in the same cases there were present warty vegetations on the valves of the left side of the heart. We shall briefly consider what authority there exists for leading us to the conclusion that these obstructing deposits were derived from the left side of the heart. In order to give Mr. Hinkes' theory every chance of success, being correct we shall refer to the observations which he deduces from the first case he brings before us in order to prove his view. From the nature of this case he gives us two reasons for his concluding that the plug found in the vessel was not of local origin:—

1. The suddenness with which the cerebral symptoms came on made it probable that the blocking up of the vessel was equally sudden and not the gradual coagulation of blood in this situation.

2. The absence of all appearance of local mischief in the coats of the vessels at the obstructed part, and of general disease.
in the arterial coats elsewhere, also pointed to some other than a local origin for the clot. Upon three grounds and from the presence of warty vegetations on the valves of the heart, he concludes, that a mass or more of these deposits had become detached and carried into the stream of blood along the carotid artery, until arrested at the angle where the middle cerebral vessel proceeds. This conclusion, he informs us, appears so reasonable that it is difficult to doubt its correctness.

Without making an remark in respect to the validity of this theory, we shall consider the proof he offers us for other than a local origin of the clot. It may appear very plausible in theory to suppose that because the cerebral symptoms were of sudden occurrence, the blocking up of the vessels was equally so, yet cases on record are not few which oppose this. There is one of so recent a date as last Winter, which came under our direct observation in the Clinical wards of the Royal Infirmary.
Infirmary here under the care of Professor Bennett. In this case the Patient, who was a man apparently about fifty years of age, was suddenly attacked with cerebral symptoms corresponding as much as possible to the cases referred to by Dr. Hirkes. At first, suddenly developed hemiplegia, followed in a few hours by loss of speech - the hemiplegia, at first slight, gradually increased and ultimately complete paralysis ensued, first in regard to the motion, and soon after in the loss of sensation. For the first two or three days the Patient appeared conscious, but after that became insensible, and died about the fifth day after the seizure, in a state of coma. On making a post-mortem examination the chief lesion to be detected was an obstruction of the basilar artery by means of a coagulum of fibrine with incrustation of Phosphat of Lime on the walls of the vessels, and softening with disorganization of the part of the brain normally supplied by that vessel.
In warty vegetations were to be found on the valves of the heart.

The particulars of this case make it obvious to us, that we may have cases of suddenly developed hemiplegia resulting from the gradual formation of an obstruction, such as a plug of fibrine.

We may therefore deduce from it, that the sudden development of the cerebral symptoms does not in the smallest degree, as supposed by Dr. Yorke, go to support his views.

With regard to the second point brought forward by Dr. Yorke, where he states that the absence of local anæmia in the coats of the vessels at the obstructed part and general diseaue of the arterial coats elsewhere assist in supporting his views. It almost seems as if he had forgotten the description of the post-mortem examination of the case, with reference to which he made these remarks— for, under the same, he informs us that a few specks of yellow deposit were found on...
on the coats of the vessels where the obstruc-
tion occurred; and at the same time there
were scattered deposits in the coats of the
aorta, with thickening of the aortic and
anterior disease of the mitral valve. It
cannot then but be apparent that a de-
spirited state of the system favorable to
arterial degeneration was present, and
that disease of the arterial coats existed to a
considerable extent. This point then not being
satisfactorily proved, as in the first, seems
very little in supporting his views.

The whole of the evidence then, as
nearly as, brought forward by Dr. Weeks
in the simple co-existence of the occurrence
of white softening of the brain, from obstruc-
tion in one of the cerebral vessels by means
of a fibrous deposit, with scaly vegeta-
tions on the valves of the left side of the
Heart.

We shall now pass on in order to
explain what manner the co-existence of
two such lesions ever is likely to take place
without bringing them in relation to each
other.
Other as cause and effect. — In order that fibrous concretions may be deposited in one or more parts of the circulating machinery, where a favorable site presents itself, one of two causes is requisite — superficialization of the blood, which may be relative or absolute; and languid motion of the blood current. Thus they are met with in various lyphs of disease and under very different conditions — in the inflammatory or sthenic disease, and in the depressed or asthenic disorders of the system.* And so where such a state of the blood exists we may expect fibrous deposits to take place in any part of the vascular system, whenever a condition of the vessel favorable to their deposition presents itself, as in instances where the motion of the blood is impeded by passing through a dilated Artery, over a roughened surface, or past an obstructing barrier, the result is a deposit of fibrous consequent on the retardation.

We must therefore admit that in the arteries and veins blood can coagulate during

* Dr. Richardson.
during life, and becoming organized and adherent to the walls, obliterates the canal of the vessels. Instances of this have been accumulated in abundance by Hodgson, Burns, Heyzig, Bertin, Boulleau, Lasue, Belfrane, Cruveilhier, Hope, Mr. Arnott, and Mr. Robert Lee. In short, there is scarcely a single considerable vessel in which the concretions in question have not been found. Instead of considering them the cerebral vessels as being free from this kind of lesion, we are at liberty to consider it as being more common in them, from the known frequency of disease in these vessels producing roughness in their coats, and obstructing barriers with the peculiarity of the circulation within the cranium, all of which are states favorable to the deposition of fibrine. The heart in a normal condition presents states favorable to the deposition of fibrine, such as the projection in its interior, the retardation of the blood current &c. Yet we rarely find these deposits on its interior, without the previous existence of vascular disease.
disease or endocarditis. When disease exists in the cerebral vessels we are most likely to have disease of the valves, and these two lesions, along with the requisite condition of the blood, readily explain the coexistence of fibrinous deposits in the two situations, and instead of being related to each other as cause and effect, are the results of the depraved nutrition giving rise to the disease in the valves and coats of the vessel on the one hand, and with the super-fibrinous state of the blood on the other. It appears that all these occurrences may take place in a common constitutional affection, acute Rheumatism. It is scarcely necessary to state that in this affection the blood abounds with fibrine. In some cases the increase may be from three parts the normal quantity to ten parts in 1000 of blood. Endocarditis is very often associated with Rheumatism, and not un- frequently there results at the same time an atheromatous state of the valves. — The
inflammation (if we may so call it) in the endocardium tends to increase the already super-fibrous state of the blood, while the state of the membrane produced by this disease along with the atheroma of the valves, tends to produce states not normally present favorable to the deposition of fibrine. All these circumstances render it probable that fibrous deposits in the interior of the heart are of frequent occurrence in patients of a rheumatic tendency. At the same time the rheumatic constitution tends to produce disease in the coats of arteries with all its attendant results. The cerebral vessels being thus affected present all the conditions requisite for the deposit of fibrine, and such a lesion no doubt is unfortunately of too frequent occurrence.

From these considerations we are readily enabled to understand the connection between the obstruction, in one or more cerebral vessels, and the rusty vegetations. Notwithstanding these remarks...
remarks we are far from being at liberty to conclude that obstructions in one of the cerebral vessels producing its disastrous results, never occurs in accordance with the theory of Dr. Kirkes, and much less are we entitled to consider all cases, as Dr. Kirkes seems to do, where obstruction occurs in one of the cerebral vessels by means of a fibrinous clot to be the result of the detachment of fibrinous deposits from the interior of the heart, and their mixture with the circulating blood. - Ends.

:carditis, except by rendering the interior of the heart through the lesions produced, favorable to the deposition of fibrine, acts merely as inflammation in another organ by increasing the fibrine of the blood throughout the system, and not by specially increasing the fibrine of the blood in connection with the inflamed part so as to render fibrinous deposits likely to occur in the cardiac organ, and so where else. We might rather expect the fibrine to be diminished in the region of the inflamed part.
part may which as its vital power is weakened, and increased throughout the other parts of the system where the vital power is excited.

It is not easy to explain, in accordance with Dr. Hikes' theory, why these watery vegetations, or rather deposits, are of so frequent occurrence on the values of the heart, and yet obstruction by deposits of fibrin so rare in the cerebral vessels; and the peculiarity of these deposits of the heart has been mentioned in the cases where plugging of the vessel is said to have occurred. From all these remarks, we may view with safety state, that Dr. Hikes' theory requires much stronger evidence before it can be established.

And with regard to the farther investigations of Dr. Hikes in relation to this subject, they may all be treated of some thing in the same manner.

The conclusions we may deduce from the foregoing considerations are thus:

That obstructions in one or more
of the cerebral vessels by means of a clot of flocculent giving rise to cerebral softening, is not unfrequently coincident with warty vegetations on the valves of the left side of the Heart. The most probable relation which they bear to each other, so far as evidence goes, is that they are merely coexistent and referable to the same cause. Although possibly in some cases they may be allied to each other as cause and effect, we have not as yet been able to distinguish between these two classes apparently so very differently allied.
III. The connection between Hypertrophy of the left ventricle of the Heart, and Valvular disease, with cerebral affection.

The influence of Hypertrophy of the left ventricle of the heart in the production of cerebral disease, is a subject which has, more or less, for many years back, engaged the attention of Pathologists. The first who appears to have taken notice of the influence of Hypertrophy in causing Apoplexy was Legallois in a communication made to the Society of the School of Medicine in Paris. This was soon followed by one from Dr. Richerand, of which the case of the illustrious Cabanis was the subject. These were succeeded by Dr. Bridieau, Nottau, Dr. Dr. Bartin, Bouilland, Andral, Hope, Elendenning, and others, who have all more or less investigated the subject. Dr. Hope, informs us, that apoplexy arises mainly upon Hypertrophy is one of the best established doctrines of modern Pathology. How far this opinion of Dr. Hope may be consistent with reason we intend in the following pages to consider briefly, along with the general view taken by the other authorities on this subject.
The heart, we know, when in its healthy and normal condition and its mechanism perfect, is well calculated to deal out to each organ its due supply of what constitutes its proper sustentiment and stimulus, and that with a degree of force consistent with the health and well being of the several organs. But when disease so affects this all important organ as to interfere with its double office, that of being the reservoir and agent of supply, we find the injurious effects of such disease exhibiting themselves in some organs having more, while others have less, than their due quantity of blood, the excess and the deficiency being equally hurtful to the respective organs in which they occur, although in a different way. Yet these injurious effects we fortunately find in most cases to be wonderfully mitigated, if not prevented, by that grand compensation of nature in the formation of an Hypertrophy, which arrests on the one hand an excessive supply, and on the other prevents the fatal deficiency of blood which might result.

Pathologists, who have referred to this subject have almost entirely confined their attention to the excess of the normal quantity of blood, or
the congestion produced in organs by disease of the heart, while a very few others have considered the effects due to the deficiency of blood that results to other organs, and consequent hurt to their nutrition and function. Under this latter class we place Dr. Law of Dublin; under the former we may rank Hope, Kraigie and most of the other writers mentioned, who suppose—and their view without further investigation seems most plausible—that in Hypeflystrophy of the left Ventricle of the Heart, we have an undue force of propulsion of blood from that organ, determined by the Hypertrophy which must operate injuriously upon the Brain, from the peculiarity of its vessels, little able to sustain such an impulse, especially if to their normal unfitness be superadded the change in their structure which time often produces in the arterial tissue generally, a change which we have perhaps more frequently observed in the arteries of the brain than elsewhere. Dr. Hope, with the intention of supporting his doctrine, informs us, in his treatise, that eight or nine cases of apoplexy, y numerous cases of Palsy from Hypertrophy, had within a few years fallen under his observation. The
majority of patients he informs us, exhibited what is commonly called the apoplectic constitution, in others these characters were absent, and the total number of cases of Apoplexy from Hypertrophy were much greater than he had witnessed during the same period of Apoplexy from causes independent of Hypertrophy.

With regard to the manner in which Dr. Hope has drawn up his cases of apoplexy, we shall just make a few remarks. Out of thirty nine cases of Apoplexy, there were twelve where the heart was healthy, and twenty seven where it was diseased. Thus Dr. Hope concludes that disease of the heart accompanied fatal apoplexy in no less than twenty seven out of thirty nine cases. All these cases of Apoplexy connected with heart disease occurred after the age of forty, the age in which apoplexy is most common, independent of heart disease, and we have no authority to suppose that Hypertrophy was the chief lesion of the heart in those cases. Consequently Dr. Hope's cases do not assist us anything in studying how far the state of the heart and that of the brain may be
alike as cause and effect. We know that disease of the
heart is a very common lesion in persons cut off
by any disease in advanced life. The following
Table serves to show how far cases of cerebral hemor-
rhage are connected with Hypertrophy:—

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<tr>
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<th>Deaths from Cerebral Hemorrhage</th>
<th>Heart Hypertrophous</th>
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<tr>
<td>Rouchoux</td>
<td>42</td>
<td>5</td>
</tr>
<tr>
<td>Andral</td>
<td>17</td>
<td>9</td>
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<tr>
<td>D. Tardel</td>
<td>28</td>
<td>8</td>
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<td>87</td>
<td>20</td>
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</table>

Calculating from these results there
seems evidence that the heart was hypertrophous
in 24.12 per 100 of cases of cerebral hemorrhage.
That the ages of these persons were somewhat
advanced may be admitted from the known
laws of cerebral hemorrhage. Dr. Tardel at the
Salpetriere having carefully examined the bodies
of sixty aged persons, cut off by other than
cerebral disease, found the heart sound in forty
five, hypertrophous in fifteen of the number,
or 33.15 per 100 cases. From these results we
have no proof whatever that the number of
hypertrophous
hypertrophous hearts in the victims of cerebral hemor-
riage just noted and per-cented is greater than it
would prove in a like number of aged people cut off
by diseases indiscriminately, affecting other organs
than the brain. So far then as evidence goes, the
only conclusions we must draw as to cause and
effect in cases where cardiac hypertrophy and cerebral
hemorrhage are found, are insufficient to satisfy us
as to the validity of the doctrine that cerebral hemor-
riage is often caused by hypertrophy of the left
ventricle of the heart. The reason of this is not
difficult of explanation. In order that the increased
impulse from an hypertrophied left ventricle
shall act on the brain as a cause of apoplexy,
whether this be simply congestive, hemorrhagic or
dependent on red softening, the impediment to
the circulation upon which the hypertrophy most
commonly depends must be situated more remote
from the heart than the origin of the vessels which
carry the blood to the cerebral organs. Now,
we know that valvular constriction or regurgitation
is a very common cause of hypertrophy, and
the only state, upon the authority of Dr. Malehe,
who has had a vast experience in this claus
of diseases, that pure and simple cases of hypertrophy are rare, and that valvular affection only exists to modify the results. This shows that apoplexy can be rarely caused by hypertrophy.

In order further to elucidate this subject, we shall suppose a case of hypertrophy of the left ventricle of the heart, from an obstruction placed at the very mouth of the aorta, which is one of the most common causes of this affection. We have the augmented action of the heart acting itself upon the obstruction, and not propagated beyond, as we may judge from the pulse which is not characterized by tone or strength. The obstruction when placed here serves as a protection, or, in a common expression, a kind of breakwater to the parts situated beyond it. The may consider then that the hypertrophy does nothing more in the greater number of cases than compensate for the diminished supply of blood to organs, which would necessarily result from the obstruction and regurgitation in the valves. It is only then in the simple cases of hypertrophy that the brain is subject to the increased impulse given to the blood, and
such cases ending in cerebral hemorrhage must be very rare so long as the walls of the cerebral vessels are free from disease. In those instances in which the two affections have been found associated, they no doubt have been quite as often if not oftener coincident, than bearing the relation to each other of cause and effect. It is not difficult to understand how these two diseases may be coincident, the same departure from the normal nutrition which occasions calcareous degeneration of the vessels of the brain, and thus pre-dispose them to rupture upon the application of any exciting cause would be likely to occasion disease of the vessels of the heart and the first part of the arch of the aorta, and so strongly predispose to hypertrophy, thus the two diseases are merely coincident and the ultimate result of the depraved nutrition. From these remarks it cannot but appear very manifest that far too much importance has been attached by modern Pathologists to the influence of hypertrophy of the left ventricle of the heart in causing Apoplexy. In support of this view perhaps it may be allowed to add the authority of Mr. Hood of Pennsylvania, who remarks "so far as my own observations have gone comparatively very few cases"
cases of disease of the heart terminate in apoplexy. Cardiac affections are very common in the Pennsyl-
vania Hospital, and patients frequently die of their consequence; but during the period of my attendance I cannot recall a case in which apoplexy resulted." Rockous also states that he have remarked before that of forty-two cases of apoplexy, three only presented Aneurism of the Heart.

The conclusions then that we deduce from the foregoing remarks are:

1st. Apoplexy is very seldom the result of Hypertrophy of the left ventricle, and in those few cases the hypertrophy must be pure and simple.

2nd. Apoplexy in a considerable number of cases may be coincident with Hypertrophy, and then they are generally the ultimate result of the same predisposing state, or a departure from the normal nutrition.

Further, in relation to this subject, we may consider the connection between White softening of the Brain and Hypertrophy with valvular lesion. These two affections we not unfrequently meet with in the same case.
It is to Dr. Law of Dublin that we are indebted for the records of cases of this nature. That gentleman has investigated this affection with great care and accuracy, and the results of his proceedings have brought him to the following conclusion: That softening of the brain brought on by deficient nutrition is often the result of obstruction in one or more of the orifices of the left side of the heart accompanied with hypertrophy.

It is our intention briefly to review this theory as propounded by Dr. Law and to consider how far the evidence brought forward by him may go to substantiate his views. And we shall begin with the first case stated by Dr. Law, which is that of a female aged seventeen labouring under disease of the heart and hemiplegia of the right side; the heart’s action was very strong and tumultuous, accompanied with a briet de rabe; the pulse was small and irregular - in addition to the hemiplegia she had lost the power of speech. The account given of her was, that for two years she had been labouring under distressing palpitation of the heart and oppression of breathing, and that the paralytic affection had come on very gradually.
gradually and at a much later period. She only survived her admission into Hospital for four days. The examination of the body disclosed the following appearances - the brain scarcely exhibited any trace of blood; it was in a complete state of anemia; when cut into at the upper and back part of the left hemisphere a quantity of a greenish yellow fluid of the consistence of cream poured out, leaving a regular depression under the surface. There was considerable hypertrophy of the left ventricle of the heart; the mitral valve was quite unfit for the performance of its functions by induration of its structure, and having warty vegetations attached to its free margin; the Aorta was much smaller than natural, and so were its primary branches; the lungs were very much congested and exhibited many nodules of pulmonary apoplexy. The circumstances of this case suggested to Dr. Law, or rather as he says proved to him, that hemorrhage of the brain, the result of disease of the heart, is sometimes the effect of a deficiency of blood sent from that organ to the brain. The
anemic condition of the brain, and the smallness of the Aorta and branches proceeding from it on the one hand; and the congested state of the lungs with the pulmonary apoplexy on the other - but this united testimony, he supposes, in proof of this.

"By as much as the brain was deprived of its due supply of blood, by so much were the lungs over supplied, and that this state of things had been of considerable duration was concluded from the size of the Aorta and its branches, which illustrated a physiological accommodation of these vessels to the diminished stream of blood that they had now to carry, the greater proportion of which regurgitated through the imperfect aortal valve."

Dr. Law then goes on to describe several other cases of a like nature in which paralysis, the result of white softening in the brain, was caused, as he supposes, by valvular constriction or regurgitation of the left side of the Heart. In order to explain his theory of veno-encephalism of the brain being caused by deficient nutrition, the effect of valvular disease, he states that in the ordinary disease of the valves of the Aorta
the lesion acts in a twofold manner to deprive the brain of its due supply of blood. In the first instance the nature of the lesion is generally such as to prevent the valves closing applying themselves to the sides of the artery, and there, forming an obstruction at the mouth of the vessel, hinder the blood issuing in a full stream from the ventricle, and in the next place the regurgitation into the ventricle through the imperfect valves. That his views upon this point are correct he is fully persuaded, from the fact of the perfect coincidence that exists between the signs and symptoms of this lesion and those of hemorhage — the same bruit de soufflet of the heart and large arteries exists in both; the same vibratory character of the pulse; the same visible pulsation of the arteries; the same pallid, palpitating complexion; and as a symptom of this cardiac lesion, the same vertigo and sense of giddiness which are so constantly observed in profuse hemorhage.

On considering then Dr. Law's theory, with the evidence he brings forward, it seems at first sight very plausible and almost unimpeachable; yet it appears to us upon further investigation...
investigating the matter that a somewhat different explanation might be offered as regards the cause of the cerebral lesion which produced death.

Taking Dr. Law's first case which we have quoted, namely that of the female aged seventeen who had laboured so long under distressing palpitation and presented as much as possible, if we are to judge from the short description of the case given us, all the characters of Chlorosis: it seems to us most probable, and we have every reason to conclude that this female had been labouring under Anemia, or was in a state at least very much approaching to it, and that this was the predisposing cause of both the cardiac and cerebral lesions which followed. With all due respect to Dr. Law's theory, it seems to us most reasonable to explain the case thus:--The female first laboured under Anemia, which gave rise to palpitation--a most common symptom in that deformed state of the system followed by hypertrophy, which is also an effect of this disease--at the same time the defective state of the blood...
pre disposed to softening of the brain, a result not unfrequently observed in anemic persons, and which in this case might have been assisted by the narrow state of the aorta and insufficiency of the aortal valve; but we are by no means to consider these lesions as the sole or even chief cause of the cerebral affection. It is evident then that Dr. Law has come to a too hasty conclusion in regard to the connection between the Cardiac and cerebral disorders.

There is another mode in which we can easily suppose retentionment of the brain with consequent paralysis to coexist with hypertrophy of the left ventricle of the heart, and narrowing of the aorta as well as disease of the valves. Thus in disease of the first part of the aorta with narrowing and insufficiency of its valves hypertrophy is almost certain to exist, and the same constitutional tendency to disease of these parts may cause a degeneration of the vessels of the brain, which, as not un frequently happens, may produce obstruction.
in these vessels and thus directly predispose to softening from deficient supply of blood independent of the cardiac affection. In nearly all valvular diseases of the left side of the heart with attendant hypertrophy unless some predisposing cause exist to softening in the brain, the tendency to that lesion is in almost every case prevented by the undue force of contraction in the hypertrophied ventricle which supplies to the brain blood sufficient to avert the fatal occurrence of white softening. How often do we see in those severe and fatal cases of valvular disease of the heart, death taking place not as the result of a deficient supply of blood sent to the brain, but the effect produced in organs by the congestion resulting from regurgitation or constriction in the orifices of the heart. In such cases no remissiveness of the brain is to be found, but very probably we may find venous congestion of that organ, with, as not uncommonly happens, dispeepal effusions into the ventricle, the pressure
pressure from which produced the coma ter
cinating fatally.

From these remarks we may deduce
the following observations - that Remoliment
or white softening of the brain, from a de
sicient or depraved nutrition, is seldom if
ever the independent result of Hypertrophy of
the left ventricle of the heart with valcular
disease; and in those cases where they do
coccur they may generally be found to
be attributable to the same predisposing cause,
or independent of each other.

IV. The connection between fatty degeneration
of the Heart and cerebral affection.

There are two distinct diseases of the heart
commonly classed under the head of Fatty
degeneration. - The first which has been long
recognized is that which is generally to be
observed in individuals remarkable for their
obesity, and consists in a deposition of fat
in a greater or less quantity around the
organ.
organ so as to interfere with the due per-
formance of its function. The site of the
deposit is generally between the Pericardium
and muscular substance, and results in
a thinning and softening of the walls of
the heart, probably from absorption caused
by pressure. The second form is an
adipose degeneration supposed to commence
in the muscular structure and to be a
true transformation.

It does not come within the range
of the present subject to describe the pathologi-
cal anatomy of this disease, a point which
is pretty clearly made out through the
assistance of the Microscope. This affection
is of much more frequent occurrence than
is generally supposed, in fact it is a very
common lesion, and rarely produces the
sudden and disastrous result generally
attributed to it. Patients labouring under
the affection may die gradually and
mildly as from Phthisis.

It is to this latter form of the
disease that our attention must be chiefly
affected
directed. In milder forms and during the commencement these may be freedom from any cerebral disturbance; as the disease advances however we have dullness of vision, aching sensations in the head, vertigo, feebleness of intellect, especially of memory, and somnolence becoming common either as almost habitual states or paroxysmal occurrences. The case may proceed farther the patient becoming suddenly seized with an attack having the appearance of apoplexy. The attacks rarely occur without some warning to the patient in some sensation referable to the epigastrium and head: in others a momentary unsteadiness in walking, or a tendency to faint, while in the more decided cases the patient becomes suddenly comatose. In most of these cases there are numerous seizures at irregular intervals. When the disease is thus far advanced it has invariably a fatal termination.

These pseudo-apoplectic seizures differ from ordinary sanguineous apoplexy in three particulars, viz. the frequent repetition of the attacks, the rarity of consequent paralysis.

*Dr. Walshe.*
and the fact that there is not only danger from an antiphilosophic treatment but benefit both remedial and preventative in many cases from the use of stimulants.

We shall make a few brief remarks in regard to the connection between those cerebral phenomena and the cardiac affection. Authors who treat of this subject seem to consider these apoplecticiform attacks as dependent upon deficient arterial supply and venous stasis. They seem to be led to this conclusion from the weak cardiac action which exists, and from the close alliance between these apoplecticiform attacks and syncope. In favour of this view Dr. Stokes relates a case in which on the occurrence of the premonitory symptoms, the patient, by hanging his head so that it rested on the floor, used to save himself from an attack. This opinion given by those authorities is very evidently defective in explaining the subject under consideration. In the first place, we have no evidence that a deficient arterial supply does in general give rise to those

* Dr. Stokes.
those peculiar cerebral phenomena. Secondly, there is a permanent deficient supply of blood to the brain, no more than as there is a permanent feeble action of the Cardiac organ, and yet those cerebral phenomena appear only at irregular intervals. We have no evidence afforded us that the arterial supply was more deficient, or in other words, the cardiac action was more feeble immediately preceding the attack than during the interval; and consequently we are not justified in supposing that deficient vascular supply is the direct cause of those apoplectiform attacks.

The most tenable view to be taken is, to consider the brain as labouring under an irritable state, analogous to what occurs in the paroxysmal functional diseases of that organ. This irritable condition of the brain is brought on by the deficient vascular supply which results from fatty degeneration of the cardiac organ, and upon the application of a slight exciting cause these pseudo-aphlectic attacks are induced. The exciting
causes no doubt may be various, probably whatever has a tendency to produce cerebral depression, as depressing mental emotions, such as fear, anger, etc.

With regard to the treatment of such affections, it must at once strike us that stimulants both externally and internally is the proper mode, and by the timely use of such medicines the paroxysm may be warded off. Unfortunately however it must be apparent to us that treatment at the worst in this cerebral disorder can only be palliative inasmuch as the cardiac affection goes on progressing, and consequently the state of the brain becomes inevitably worse and more easily acted on by an exciting cause, until at last a sudden apoplectic attack is attended by fatal and often unexpected results.

James Clement.

Edinburgh 31 March 1856.