LUMLEIAN LECTURES

ON THE

PATHOLOGY OF THE PNEUMOGASTRIC NERVE.

Delivered at the Royal College of Physicians.

By S. O. HABERSHON, M.D., F.R.C.P.,

Senior Physician to and Lecturer on Medicine at Guy's Hospital.

LECTURE II.—*Concluded.*

THE most important of the animal functions, that of the circulation, is very directly influenced by the state of its nervous supply. A very large plexus of nerves is formed by the branches of the pneumogastric with those of the sympathetic; these pass down from the neck, and at the arch of the aorta the cardiac plexuses are situated, from which numerous branches pass down to the heart itself. Irritation of the cardiac nerves and of the pneumogastric produces distress and pain, and it has been shown that the movements of the heart are retarded, that the diastole is prolonged, and there is diminished pressure in the vessels. When the nerve is paralysed, as by experimental section, the inhibitory power is taken away, and the heart acts at first with increased force. We find, in pathological investigations, that disease presents us with some symptoms which are due to spasmodic irritation, whilst others may be traced to exhaustion, or paralysis of the nerve.

The spasmodic affections and the paralytic ones, also, may be referred to ventral, to local, or to peripheral causes.

Spasmodic irritation.	{	Central ... { Nervous shock
		{ Renal disease (?)
		Local Diseased coronary arteries
Angina	{	Peripheral... Gout, etc.
		Central..... Apoplexy
Paralysis	{	Local Pericardial effusion; carditis; etc.
		{ Acute disease of the abdomen; peritonitis; etc.
		Peripheral { Cold in the stomach, or a sudden blow

It is not necessary to do more than very briefly to refer to these conditions. The cardiac distress which is produced by nervous shock is an instance of the action of the cerebrum and the emotional centres upon the origin of the pneumogastric, and thus upon the lungs and heart. The effect is due in a greater degree to the pneumogastric than to the sympathetic nerve; although, in all cardiac affections, the action of the vaso-motor nerve is exceedingly important. Altered nervous supply is the cause of the great distress in many organic diseases of the heart; the afferent fibres of the cardiac branches of the pneumogastric are closely united with the sympathetic in the cardiac plexus, and by the efferent fibres from the pneumogastric centre the respiration becomes affected as well as the action of the heart. Whilst saying this, we would not overlook the mechanical interference with the heart in disease of the valves, in dilatation, and in disordered states of the muscular walls of the heart. In renal disease, attacks of severe angina come on where there is chronic disease of the gland, as in the small granular kidney, but many considerations must be borne in mind in reference to this disease; there are degeneration of the minute capillary vessels and altered tension of the arteries, the muscular coat of the ventricles is hypertrophied, and the blood is changed in character, and the respiratory centres are affected by this impure blood. At the same time, also, that the afferent nerves convey impression from the pneumogastric branch to the kidney and renal plexus of nerves, the branches of the sympathetic nerve connected with the vessels also affect the same nerve-centres. The action of the cardiac ganglia upon the heart is also a more direct source of disturbance in these cases. The same remarks apply to those instances of angina pectoris where the coronary vessels are extensively diseased, and also to those in which gouty disease has led to degenerative change without the production of renal disease and albuminuria. These patients complain of distress at the chest, there is breathlessness on exertion, or on going up stairs, it may be with a sense of choking, and with a dry cough; at night, however, especially after the first sleep, the patient awakes in great distress at the heart, with irregular fluttering movements, palpitation, and inability to get the breath. The paroxysm soon subsides, but it greatly alarms and distresses. Sometimes, when the disease is more severe, the distress at the chest, the pain, or rather the "breast-pang", occurs after very slight exertion. On the most

careful physical examination, no abnormal sound may be heard; but there is evidently disturbance of the function of the heart. There is inhibitory action of the nerves of the heart, and the pneumogastric is at fault. The suffering complained of is that of agonising fear of death, unless the heart recovers its power; but, in other cases, it is intense darting pain through the left side in the direction of the heart. To stimulate the heart to increased action, by ether, and by diffusible stimulants, as ammonia, may be of value when they can be resorted to.

It is interesting to find in some of these instances of gouty disease affecting sometimes the heart, and sometimes the kidneys, that the hepatic function is also disturbed and a transient glycosuria is induced; it would seem that other branches of the pneumogastric besides those to the thoracic viscera are involved, and this condition of sugar in the urine, although decided in quantity, may be the more easily overlooked, from the comparatively low specific gravity of the urine. It is well known that in gouty disease, with chronic affection of the kidney, the urine is often of a low specific gravity, and sugar may be present, whilst the urine only attains a density of 1015 to 1020, or a little more. This state is important to be recognised, for it has an essential bearing both upon the progress and the treatment of the disease; and, if it be overlooked, the malady may make rapid and downward progress.

Some have referred the sudden cessation of the heart's action during the administration of chloroform to this inhibitory action of the pneumogastric, and they state that the heart would act more efficiently if this restraining force were removed by the full narcotic action upon the centre of the nerve. (See an interesting communication on this subject by Dr. Lauder Brunton in the BRITISH MEDICAL JOURNAL.)

The pathological states produced by severe apoplectic effusions are of great interest in connection with the pneumogastric. We have already referred to the slow and irregular breathing which is observed when a clot of blood in the fourth ventricle directly interferes with the origin of the nerve, but the effect is also shown upon the heart; the restraining power is removed, it is partially paralysed, and the heart beats with increased force. It is, however, in many of these cases, that the vessels are diseased and the left ventricle hypertrophied. A sense of exhaustion and apparent weakness of the heart's action is often complained of by the patients suffering from cerebral oppression. The weakness is *imaginary* rather than real, and we find that such patients will try sometimes to relieve their state by freely partaking of wine and similar stimulants, which augment rather than palliate their condition. A gentleman who had suffered from exposure on the West Coast of Africa, which had caused sun-stroke, etc., was found taking a glass of champagne every two hours to relieve his "debility"; but the disease was more effectually removed by spare diet and by smart action from the bowels.

In pericardiac effusion and in inflammatory carditis, the heart's action is diminished in power, and there is exhaustion of the nerve-supply. This is especially connected with the condition of the sympathetic nerve, and with the cardiac ganglia; the pneumogastric nerve is, however, affected, for we find that the respiration is quickened, and the whole of the parts supplied by the pneumogastric sympathise; the voice is feeble, and the digestion is impaired. This is one of the diseases in which it is of great importance, whilst we recognise the local, not to forget the general condition of the patient, to try to lessen the local affection, but to sustain the exhausted functional activity of this, the most important nerve of animal life.

The ganglionic nerve-supply of the stomach and abdomen is in intimate relation with the cardiac plexus. The pneumogastric nerve, although it is especially distributed to the muscular coat of the stomach, is also in the closest connection with both the peritoneal and the mucous layers. In acute diseases of the mucous membrane of the stomach, as in poisoning by arsenic, the heart's action becomes extremely feeble, and the pulse compressible, and the same is true in acute peritonitis; the collapse of the patient is an expression of this intimate relationship. Witness the almost instantaneous effect of a perforating ulcer producing acute peritonitis; the heart's power at once fails, the patient becomes cold and almost pulseless; the eye sunken and the extremities cold; the cardiac plexus and the pneumogastric of the heart at once sympathise with the solar plexus and the pneumogastric branches of the abdomen—the afferent branches of the latter, in their action on the medullary centre, cause reflex action on both pulmonary and cardiac nerves.

In many other affections of the gastric mucous membrane, this reflex action on the heart is recognised, in ordinary stomach disturbance, as a bilious attack; the nerve-power is weakened by irritation of the mucous membrane, perhaps the sympathetic nerve is exhausted, the vessels dilated, and we thus find a sense of exhaustion produced, with feebleness of the heart's action; too often, when this state is produced

by the irritation of alcoholic stimulant, the patient seeks to relieve the symptom by a fresh dose of the stimulant, and thereby increases and perpetuates the disease. The constant repetition of this process of exhaustion and renewed overstimulation leads to the most disastrous results, in causing chronic disease of the stomach and of the liver, with disorder of the nervous system. It is of no avail to attempt to relieve the weakened power of the heart, and exhausted nervous energy, if the patient persist even in moderate potations of alcohol; and, as a rule, it is the better plan at once to cease from all alcoholic stimulant; the stomach and the heart will then recover in a great degree their former energy and strength.

A sudden blow upon the epigastrium has been known at once to stop the heart's action and to produce instant death, and with almost equal power a shock from cold will stop the action of the heart; these, also, are instances of reflex action affecting the heart from peripheral disturbance.

We have thus brought before your notice pathological conditions of a very diverse character affecting the branches of the pneumogastric nerve supplied to the thoracic viscera. To mistake those which arise from a central origin, as from a local cause, is to misunderstand the whole character of the disease; so, also, if we refer those which are produced by peripheral disturbance to mere irritation in the parts only affected by reflex action, we fail to relieve the symptoms, because the treatment is misdirected, and therefore unavailing.

THE CROONIAN LECTURES

ON

THE PATHOLOGY AND RELATIONS OF ALBUMINURIA.

Delivered at the Royal College of Physicians.

By W. HOWSHIP DICKINSON, M.D. Cantab., F.R.C.P.,

Physician and Lecturer on Pathology at St. George's Hospital;
Senior Physician to the Hospital for Sick Children; etc.

LECTURE II.—*Concluded.*

BEFORE proceeding to other questions, it may be well to inquire how often the renal fibrosis is concurrent with a similar change in other organs; how often it is merely one manifestation of a general fibrotic tendency from whatever cause derived; and how often the result of influences directed solely upon the kidney.

To take as a test one organ which is prone to fibrosis and easy of observation, we may ask how often the granular kidney is associated with cirrhosis of the liver. The records of St. George's Hospital showed that of 250 cases in which the renal condition was clearly described, the liver was cirrhotic in 37; a proportion of about 1 case in 7. In Dr. Grainger Stewart's cases of the same renal disorder, cirrhosis of the liver was found in 15 per cent., almost exactly in the same proportion; a proportion so small as to show that the instances in which renal and hepatic fibrosis are connected by a common origin, to say the least, must be few. Some degree of general fibroid increase is, perhaps, one of the results of age. But, of these, it is certainly one of the least conspicuous. I have been able to examine the tissues of three reputed nonagenarians; with these, fatty and atrophic degenerations were greatly more marked than fibroid hypertrophy. But, nevertheless, the nearly constant, though slight, inequality of surface which the kidneys, and, to a less extent, the liver, displays in advanced age is enough to suggest that the process which causes it belongs rather to senility than disease. As to general fibroid exaggeration ensuant upon alcohol, I need not here recapitulate observations which show that this process is very unequally distributed among the organs; the liver suffering much, as early exposed to the influence, the kidney little, as comparatively remote from it.

We cannot but conclude that, putting the associated affection of the arterial system for the present out of the question, the kidneys become the subjects of fibrotic change, in most instances alone, as the result of a morbid instigation proper to themselves, notwithstanding that other organs become involved in consequent and various changes.

It is next of importance to inquire how far we can distinguish the causes by which this organic change is engendered.

It takes its rise, in a vast majority of instances, in no cause which can be isolated, but in innate predisposition, or in some of the circumstances which belong to the common ways and even tenour of life. Hereditary influence, not so often to be traced as with some other

disorders, is occasionally strongly declared with this. I might cite the medical history of an ancient family, in which three generations, comprising seventeen individuals, furnished eleven subjects of chronic albuminuria, undoubtedly dependent on granular degeneration, though not ascertained to be so, as far as I am aware, by any *post mortem* examination. The disease affected both males and females. Four, who have already died with it, did so after having had the disorder for many years, in one instance for twenty-three, at ages varying from twenty-six to forty-nine. It has been remarked that a peculiar pallor by which the members of this family are characterised is noticeable in their portraits long antecedent to the period of which this record treats, or to which renal diagnosis extends.

Probably more prolific in the issue of this complaint is the influence of climate, which, to be most injurious in this respect, must be, as all our records of the geography of disease concur to show, of a Lacedæmonian temper, equally avoiding the extremes of heat and cold, neither arctic nor torrid, though within temperate limits presenting much thermometric variation.

It is scarcely necessary to support this assertion by reference to the prevalence of albuminuria in England, Germany, the Northern States of America, and Australia, as contrasted with its infrequency in Southern Europe, the coasts and islands of the Mediterranean, the Cape, and India. The liability of an organ to disease is, in some sort of proportion to its activity of function, as a machine becomes more apt to strain or break the more it is urged.

In hot climates, the skin and the liver take the stress of excretion from the kidneys; while it is probable that, in arctic and subarctic regions, these excretory organs are spared by the more perfect oxidation which answers to the demand for animal heat, and ultimately adapts to respiratory exhalation matters which in ordinary circumstances would escape in earlier stages of conversion with the urine.

From causes of disease inherent to race, or inseparable as their physical conditions from diverse parts of the earth's surface, we come to others which fall with a more partial incidence upon individuals. These may be generally classed as causes of congestion or modes in which a low degree of inflammatory irritation is brought to bear upon the organ.

To speak, first, of the easiest to trace, though, perhaps, not the most frequent or the most important, mechanical venous congestion has the priority. The induration of the organs, which results from heart-disease when attended with venous obstruction, was long ago described in its palpable results by Sir W. Jenner. Looking minutely into the condition of the kidney as found in such circumstances, an instructive series of changes presents itself. To the naked eye, hardness, redness, and increase of cortical bulk, tardily followed by small, slightly indented, and irregular granulation and corresponding diminution of volume. With the microscope, distension of the blood-vessels, a large accumulation of epithelium little different, save in its abundance and irregular detachment, from that of health, and these for long the only discoverable changes. It is apparently chiefly to the excess of epithelium that the characteristic hardness of the cardiac kidney is due. After a time, though often long delayed, a more permanent injury ensues in a thickening of the fibrous tissue, attended with a sparse and scanty development of connective nuclei, which show like the thin produce of an uncultivated soil as compared with the prolific issue which causes of a less mechanical sort engender. The patience with which mechanical or venous congestion is tolerated is marked with the kidney as with other organs. How small is the result of mere turgidity as compared with that of a special stimulant; a modicum of scarlatinal poison, or of cantharides, or a chance influx of cutaneous excreta! An organ is eager to respond to or to resent an appeal to its special function, and will draw to itself blood according to its purpose; but blood merely retained in a passive gland is but fuel without fire, the means of disease without the motive.

The fact that, from long continued or oft-repeated congestion of cardiac origin, the renal fibrous tissue is sometimes increased, is evident both in external granulation and in the intimate changes as displayed in section; but the process is slowly developed and is more partial, as well as more scanty, than when it has sprung from other causes; large tracts often remaining entirely unaffected, save by epithelial accumulation. The condition of kidney described is characterised during life by urine which is at intervals scanty, lithatic, and albuminous, and between times natural. It is usually of less importance clinically than the cardiac lesion. When dropsy gives evidence of both valvular and renal mischief, it usually happens that the valvular is primary, the renal consequent.

Another condition, acting also, apparently, by way of venous obstruction, is not in itself morbid, however attended with morbid results. The pressure of the gravid uterus upon the emulgent veins and vena