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 III.

THE pneumogastric nerve in the abdomen is brought into the closest relationship with the solar plexus and semilunar ganglia of the sympathetic nerve, and it is very difficult to separate the pathological changes incident to the one from those which have their origin in the other. The par vagum reaches not only to the stomach, but to the liver, to the duodenum, to the suprarenal capsules, and to the kidney; and it unites with the phrenic nerve as the branches of the latter pass through the diaphragm. Although the pneumogastric is especially distributed to the muscular coats of the stomach and regulates its movements, still it has sentient branches, and when these are irritated pain is produced; neuralgic pain at the stomach may be due to disturbance of this nerve as well as of the sympathetic nerve. Romberg describes gastrodynia neuralgia as due to hyperæsthesia of the pneumogastric nerve, and neuralgia cæliaca as traceable to hyperæsthesia of the solar plexus. Irritation of the nerve will not only produce pain and muscular contraction, as hour-glass contraction, but vomiting, and this of several kinds; as well as altered secretion, and sometimes perverted sensation, as craving appetite. When the nerve is weakened or paralysed, another set of symptoms is observed, and we have loss of appetite, anorexia, and distension of the stomach. It will be a convenient method to consider those conditions in which we have increased irritability or spasmodic action, as shown by pain, neuralgia, hour-glass contraction, or vomiting; and, secondly, those in which there is diminished power or paralysis, in which we find anorexia or distension; and each of these may be traced to central, local, or peripheral causes.

Spasmodic vomiting.	Central	Concussion of brain
		Acute cerebral disease
		Abscess
Spasmodic vomiting.	Local	Tumour
		Tubercle
		Apoplexy
Spasmodic vomiting.	Peripheral	Over anxiety and distress
		Epilepsy
		Persistent irritability of stomach
Spasmodic pains, etc.	Central	Inflammation of mucous membrane
		Ulceration
		Cancerous disease
Spasmodic pains, etc.	Local	Phthisis; tubercle in the lung
		Disease of heart
		Uterine disease
Spasmodic pains, etc.	Peripheral	Ovarian disease
		Chlorosis; hysterical vomiting
		Renal disease; disease of suprarenal capsule
Paralysis. Anorexia. Distension.	Central	Hepatic disease
		Intestinal disease
		Peritoneal, etc.
Paralysis. Anorexia. Distension.	Local	Perverted appetite; excessive craving
		Neuralgia
		Hour-glass contraction
Paralysis. Anorexia. Distension.	Peripheral	Ulceration, etc.
		Organic disease
		Cardiac disease
Paralysis. Anorexia. Distension.	Central	Distension from exhaustion and nervous shock
		Anorexia
		Rapid fermentation, causing distension
Paralysis. Anorexia. Distension.	Local	Distension from obstruction
		Distension from peritonitis
		" " abscess
Paralysis. Anorexia. Distension.	Peripheral	" " empyema
		" " "
		" " "

The vomiting produced by cerebral disease is often of the most decided character, and it is of the greatest importance that the nature of the malady should be correctly understood. To treat the stomach while the irritation is at the cerebral extremity of the nerve, is often the greatest injury to the patient. The bilious attacks of early life are very frequently to be traced to cerebral disease, and are too often overlooked till the true character of the disease is unmistakably indicated. It is not, however, every form of acute disease of the brain

which induces this irritation of the pneumogastric nerve, but especially those cases where the base of the brain or the floor of the fourth ventricle is implicated. In an instance of acute meningeal inflammation in a muscular young man in Guy's Hospital, the stomach was so exquisitely sensitive, that if water, milk, or any fluid were swallowed, it was at once ejected with such violence that it was projected beyond the foot of the bed. After death, there was found a collection of pus in the meninges of the brain, directly pressing upon the pneumogastric nerve at its exit from the brain-substance at the medulla.

In tumours of the brain, especially at the cerebellum, the vomiting is often of the most marked character; it comes on independently of food, the tongue may be clean, and the bowels in a normal condition, but still food is rejected at irregular intervals, and especially in the morning; sometimes several days may elapse between the periods of vomiting. At times, this is the prominent symptom of commencing disease of the brain, but in other cases it is associated with severe pain, and with affection of other nerves, as the optic and olfactory; with giddiness and intolerance of sound, or with epileptiform convulsion. I have narrated a deeply interesting case of this kind in the *Guy's Hospital Reports* of 1874, and, in the last clinical session under my care, a child, about twelve years of age, was admitted quite amaurotic with one eye, and with the other she could only distinguish day from night. The symptoms had come on a month previously, with severe vomiting and pain in the head; the pupils were widely dilated, but there were no febrile symptoms. The condition appeared to indicate organic disease of the brain, such as tumour, and the prognosis was a very unfavourable one; but, under the steady use of perchloride of mercury with iodide of potassium, the symptoms entirely disappeared. The vomiting had ceased previously, but the amaurosis gradually lessened, at first in one eye, then in the other; and she was seen to be amusing herself, then nursing a doll, and soon afterwards an infant patient in the ward.

It is scarcely needful to refer to the vomiting, which is one of the earliest, although most insidious, symptoms of tuberculosis of the brain and its meninges in early life. It is often ascribed to a bilious attack, till severe convulsion comes on, or the child has severe pain in the head, or is noticed to become listless and indifferent to its ordinary amusements; as effusion takes place and coma comes on, this irritable condition of the stomach ceases, but it is often reproduced if the recumbent position of the patient be changed. The pupils, at first small and irregular, become dilated and insensible; the abdomen is often contracted; the respiration is also irregular and sighing, and the skin sensitive to cold. The capillaries, losing their tonicity, easily yield to sudden pressure or blow, and again become overcharged—the *tache cérébrale*. This irritable condition of the stomach, however, does not always exist in tuberculosis, for many instances of tuberculosis occur in adults where vomiting is absent. These cases closely resemble enteric or typhus fever, and are only recognised by close observation of the temperature and general symptoms.

The same action upon the pneumogastric is observed in *direct injury* to the brain, as in severe concussion, and it is a noticeable symptom in *incurable apoplexy*; a minute vessel gives way in the brain, and the first effects are those of sudden disturbance, as in concussion, severe pain in the head, faintness and pallor, with vomiting; then, as reaction follows, further effusion of blood takes place, and the worst symptoms of apoplectic effusion into the brain are produced. It is the greatest mistake, and often very disastrous, to treat this faintness with ardent spirits; to stimulate the action of the heart increases the subsequent effusion, and renders what might otherwise be a partial injury of brain-tissue into a destruction of most important organs. The apoplectic clot breaks through into the lateral ventricle, and, reaching to the fourth ventricle, exerts direct pressure upon the origin of the respiratory and other nerves.

Disturbance of the cerebral centre of the pneumogastric may be produced by *over-anxiety of mind and distress*. A junior partner in a large commercial house had vomiting every morning; he had no pain at the stomach, the tongue was clean, the bowels regular or relaxed, the pulse compressible; there were no intemperate habits or dissipation to induce this morning sickness; the meal was taken, but in a very short space of time rejected. It was evident that the irritability of the stomach was not due to disease of that organ; and, on making inquiry, it was found that the patient had had a fall from his horse some time previously, and the fear was entertained that organic disease of the brain had commenced. Mercantile collapse came at length, the heavy clouds of disaster broke, and when a more healthy state of money affairs was obtained, then the cerebral disquietude also ceased.

Again, we find the same irritation of the stomach produced by *epilepsy* and commencing *insanity*. The epileptic paroxysm may entirely cease, but may be replaced by attacks of nausea and vomiting,

with epileptic vertigo. It is difficult to define the precise condition of brain in these cases. The cerebral disturbance, whether anæmia or other atonic change, is sufficient to produce, not a loss of consciousness, but a transient affection of the pneumogastric nerve; in the same manner, some epileptics will describe a sensation passing over them without loss of consciousness, sometimes affecting sight, sometimes the hearing, or general sensation; in these cases, it is at the cerebral origin of the pneumogastric that the gastric disorder originates.

These symptoms are sometimes very peculiar, and the following may be taken as an example. A gentleman, aged 49, whose father was epileptic, was brought to me by his medical attendant. The patient was nervous and dyspeptic, and troubled with flatulence; he had a choking sensation as if he could not swallow, and became very uneasy. The heart's action occasionally irregular; the pulse was compressible and irritable, but there was no evidence of any organic disease; the tongue was pale and flabby, and he complained of pain at the back of the head; the countenance was not expressive of distress, but the patient said the pain was intense. It was evident that the branches of the pneumogastric were especially affected, and that the malady was connected with disorder of the nervous system, and did not arise from organic mischief. It was not one, but several branches of the nerve that were involved; and sometimes one, sometimes another, was affected.

In another, a gentleman aged 42, whose brother died of phthisis, had attacks of intense nausea, which came on every two or three months during seven years; the attacks, he said, amounted to "agony". He had a distressed countenance, and a sense of fulness of the head; the appetite was poor, and the bowels confined; there was aching, or rather increased sensitiveness, in the spine; the abdomen was relaxed, and nothing abnormal could be felt. The recti sometimes became rigid; the urine was of specific gravity 1020, and was free from albumen and from sugar. This patient was relieved by the injection of morphia, but more effectually by strengthening the nervous system. Sometimes nervous twitchings came on in these patients, as if a slight epileptiform convulsion; in others, the excessive irritability of the stomach is followed by melancholia.

Closely connected with these instances are others of persistent irritation of the mucous membrane of the stomach; the vomiting is constant, and continues every day year after year, till the patient is emaciated to the last degree. These cases are different from the irritable stomach which is found in hysteria, in chlorosis, and in uterine disease—the hysterical stomach—as it has been called; to these we shall have to refer presently. At first, there may have been some local or peripheral disturbance, some dysmenorrhœa, or affection of that kind, to originate the disease, but that soon subsides, and leaves a condition of great nervous exhaustion; still the symptoms may be worse during menstruation, because the weakness is greater. The food is rejected from the stomach almost at once, it may be without pain; but, in many instances, there is soreness at the scrobiculus cordis; there is no hæmorrhage, or only of the slightest kind; mucus is rejected, and patients often refer to this as the cause of the disease. The tongue is often clean, or nearly so; the bowels are inactive; neuralgic headache is often complained of. In many cases, these patients are said to have organic disease of the stomach, ulceration, or even malignant disease; the reduction of strength may be extreme; and ordinary remedies fail to lessen the irritation. It will generally be found that those remedies are most effective which lessen nerve-exhaustion; and few are better than very small doses of ammonio-citrate of iron, alone or given in a state of effervescence; sometimes nux vomica does good, and even arsenical compounds may be used with advantage, and it is of great importance to give some kind of vegetable food. Mistakes are often made in the entire abstinence from vegetables for lengthened periods; the system becomes weakened thereby, and I have seen severe scurvy produced.

It would occupy too much time to enter into the general symptoms of *diseases of the stomach*, but we may remark that vomiting is a common symptom of inflammation of this organ, both when the disease is acute and when less severe in character, but that, although the vomiting may be exceedingly severe, there may be no pain as long as the mucous membrane only is affected. Even in acute poisoning, as by arsenic, pain may be absent at the stomach, except the soreness from continual vomiting; and in the gastritis from chronic poisoning by alcohol, excessive irritability is a constant symptom, with craving for cold drinks, but only slight tenderness of the stomach itself. It is in ulceration of the stomach that pain is such a common symptom, and it is associated with the vomiting of food; pain comes on, both at the scrobiculus cordis and through to the back, soon after the food reaches the stomach, and is only relieved by the passage of food into the pylorus, or by vomiting. These patients will often produce sickness

by putting the finger into the throat, in order to spare themselves the pain of digestion. In one instance, in which the patient with chronic ulcer of the stomach gradually sank from exhaustion, I found a large branch of pneumogastric nerve passing across the floor of the ulcer: we have previously referred to this in speaking of the physiology of the nerve. In cancerous diseases, also, vomiting and pain are common symptoms; but the former may be entirely absent if the œsophageal and pyloric orifices be free from obstruction.

In reference to those instances which are more strictly reflex in character and produced by disturbance of *peripheral nerves*, there are some most interesting illustrations in ordinary practice. The irritation of the *pulmonary* branches of the pneumogastric is a common cause of disturbance of the stomach, and constant vomiting is often produced. It is true that, in the early stages of phthisis, there are often dyspeptic symptoms, a dislike of fatty food, and an impairment of digestion; tenderness at the scrobiculus cordis, furred or patchy condition of the tongue, and irregular action of the bowels; but these symptoms are less decided than the vomiting to which we refer. The irritation of the stomach is then the prominent symptom; all food is rejected, the tongue may be furred, and, unless the chest be examined with care, the true nature of the malady is overlooked. The state of the stomach may lead to a cough, but the "stomach-cough" of early phthisis is a most treacherous symptom, and equally so the vomiting to which we refer. It will often be found that when the disease in the chest, the tubercular deposit, and pneumonic and degenerative changes have advanced, the vomiting suddenly ceases, but only to reveal disease of the lung, which has made insidious progress during the time when treatment of the thoracic disease might have been most efficacious. This subsidence of the gastric symptoms often takes place on the occurrence of acute pneumonia or of acute pleurisy. The chest should be carefully examined, and the thermometric temperature recorded in these instances; and, if we can quiet the disturbance of the pulmonary branches of the pneumogastric, the gastric mischief will cease.

In disease of the *heart* of an organic kind, with obstruction, the stomach is affected by the mechanical hindrance to the blood; the right side of the heart being engorged, the liver is also distended, and with it the branches of the portal system of veins. In this way, the coronary veins of the stomach are filled; there is profuse secretion of mucus, gastric catarrh with its attendant symptoms of flatulence, pain, distress, and sometimes hæmorrhagic erosion. We do not refer to this condition, troublesome as it is, but to one of still more serious import, namely, severe vomiting; we have this occurring in mitral stenosis as well as in dilatation of the heart. It would seem that the cardiac nerves of the pneumogastric and sympathetic induce this reflex action upon the gastric nerves—perhaps the connection of the pneumogastric with the phrenic on the large hepatic vein, may be the source of this connection. The vomiting thus coming on at the later stage is often the precursor of a fatal termination.

The vomiting which is produced by *uterine disease* and by pregnancy is too well known to need even mention, but that which is a symptom of early *ovarian disease* is often overlooked. There may be no pain in the region of the ovary, no enlargement there, and the gastric symptoms may be so decided as to mislead experienced practitioners. I was called to see a lady in consultation who had vomiting a few hours after food; the vomiting was not constant, but irregular; still the emaciation was decided and progressive, the abdomen was not distended, it was free from pain, and the pylorus could be felt. This led to the opinion of organic disease at that part; the irregularity of the vomiting, however, induced me to believe that this might not be the case, and I could not consent to the decided opinion of malignant disease being present. This lady was about fifty-five years of age, and menstruation had ceased for several years. She went into the country, and, whilst there, all the gastric symptoms ceased, but the abdomen began to swell; she returned to town with evident symptoms of ovarian dropsy. I requested that my friend Dr. Oldham would meet me. She was tapped, and Mr. Spencer Wells afterwards removed successfully a large ovarian cyst. Very similar are those cases of gastric trouble in young married people, where conception has not taken place, but where there is reflex action and sympathetic disturbance from ovarian and uterine irritation of the pneumogastric nerve. These instances are often misunderstood, because menstruation continues regularly, and it may be, without pain. The gastric branches in this way become exceedingly irritable, and vomiting is a troublesome and harassing symptom: sometimes it is almost constant, at other times only on slight nervous excitement, or overfatigue; the excitement of going into company, or of mixing in society, may be quite sufficient to bring on severe vomiting. Of the same kind is the troublesome vomiting present in young people, with scanty or disordered menstruation and chlorosis. The food is rejected at once, almost as soon as it reaches

the stomach, but without much distress; there may be scarcely any pain, and some of these patients appear to be plump and well nourished. This condition has been aptly called the "hysterical stomach", and certainly the condition is one of functional irritability. Some food is retained, for the body is not wasted; the bowels are generally confined; the pulse irritable; the abdomen often fairly distended; with this state, there are other indications of nervous excitement. The determination of the patient may do an immense deal to restrain this condition, and in a young hospital patient the cure was effected by the nurse refusing to bring anything into which she could vomit. The occupation of the mind, fresh air, chalybeate tonics, free action on the bowels by aloetic and assafoetida purgatives often relieve this state. The steel may be given with advantage in a state of effervescence; in other instances, however, it is necessary to allow the stomach to rest entirely, and to feed the patient by nutrient injections. If the uterine and ovarian functions be disordered, these must, if possible, be rectified; and in the instances of married women, to which we have referred, it is often of great value to lessen pelvic irritation by opiate suppositories. It is of little use to treat one symptom while the cause of disturbance remains.

There are many other causes of peripheral disturbance of the pneumogastric nerve in the abdomen which we can only mention. Thus, in consequence of its connection with the duodenum, and with the liver and gall-bladder, we find vomiting a common symptom of many diseases of these organs. The same may be said of the kidney; a branch of the pneumogastric may be traced to the renal plexus, and the sympathy of the kidney with the stomach is due to this nervous connection as much as to the disordered secretion and altered blood. This alteration of the blood and gastric juice does not account for the vomiting and gastric disturbance which we have in calculus and some other renal affections. The function of the suprarenal capsules is still unknown, but the symptoms of a disease of this structure were well brought out in the learned lectures delivered by Dr. Greenhow last year. It is very interesting to note the very large supply of nerves distributed to this organ, and the connection of the pneumogastric with it, as explanatory of the violent vomiting, which is a prominent symptom of disease of the suprarenal capsule.

The vomiting in *peritonitis* is reflex in character, so also in those instances in which mechanical obstruction produces similar symptoms; but on these we need not dwell.

[To be continued.]

SHEFFIELD.—The last annual report for the borough of Sheffield, shows that the death-rate during the past year was equal to 26.8 per 1,000 of the population. During the same period, the birth-rate was equal to 41.6 per 1,000; and, if it could be admitted that the birth-rate so controls the death-rate, that high birth-rates produce high death-rates, Sheffield might rest contented. This theory is, however, very properly, strongly combated by Dr. Griffiths, who shows that the normal death-rate for the borough would be 21.6 per 1,000. The various causes which have tended to produce a death-rate beyond this standard, are subjected to detailed examination in a manner which must give value to the report in the locality with which it deals. Scarlet fever appears to have been very fatal, and hence the importance of isolation and of efficient disinfection are strongly insisted on. The infant mortality has also been very large. Bad dwelling accommodation evidently has its share in increasing the mortality. The borough contains localities in which wretched houses are filled to overflowing; although, in these districts, the population per acre is less than in the healthy model lodging-houses; indeed, in every way the demolition of these haunts of disease, and their replacement by more lofty and at the same time more airy dwellings, would be beneficial. The sickness and mortality which are the result of unwholesome dwellings exert, in Sheffield, as elsewhere, an enormous influence in keeping up and swelling the poor-rates, and in fostering social, moral, and physical evils. There are, however, no cellar dwellings in the borough, and, in this respect, Sheffield is better off than most of the large towns. The report shows that a large amount of work has been in progress which must tend towards improving the health of the town. The night-soil department appears to be well organised, but it is to be feared that so long as the old midden-privies remain, no efforts will do away with the evil everywhere resulting from this filthy system of excrement removal. And it is unfortunately but too notorious that, when the middens are emptied of their decomposing, and, as a rule, wet contents, the effluvia given off by the saturated brickwork, is often worse than that which arises when the structures are comparatively full. Scavenging is of course essential; but no excellence in scavenging will, in the absence of an entire reconstruction of the midden-privy, as generally seen in the north of England, effect permanent good.

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 III.

The Lardaceous Kidney.—Passing now to another form of albuminuria, we come to a change which is so widely distributed among the organs and tissues, that it is not to be limited more narrowly than by the outlines of the frame; and not only in its wide incidence does this disorder differ from those which have been discussed, but also in this: while fruitful as they are in consequent disorder, it is itself always secondary, owing no origin but in pre-existent disease. I refer to the condition which, in deference to a recommendation of the Pathological Society, I shall speak of as *lardaceous*. I need not catalogue the names which, as numerous as those bestowed upon a royal infant, mark the individual responsibilities which have been associated with it. It is enough to say that I speak of the organic change which has been spoken of as waxy, in allusion to the appearance of the affected viscera as amyloid, in view of their reaction with iodine; and as depurative, in assertion of its common origin in suppuration. The change of which the disease essentially consists is an infiltration, beginning with the arteries and afterwards penetrating widely into the tissues, of a material of which the ultimate composition is not distinguishable from that of fibrin or albumen, while its general characters are more nearly those which belong to the former of these constituents of the blood. It is not needful to recapitulate the multiplied analyses which prove what, I suppose no one now doubts, the relation of the new material to the protein bodies. The interest lies in the points of difference between this substance and the normal constituents of the body. Perhaps the most important of these is to be found in its relation to the alkalies. The presence of the lardaceous material in any tissue can be at once detected by the reaction of iodine. If, now, the weakest solution of potash or soda, or a stronger one of ammonia, be brought into contact with the infiltrated structure, its power of reacting with iodine is at once and finally abolished, and that without any destruction of the normal tissue, or even material injury to its microscopic structure. This appears to depend upon the extraordinary solubility of the morbid deposit in alkalies, a property which Dr. Marcet made use of in order to obtain it for analysis, when, at the instance of the Pathological Society, he brought his practised skill to bear upon some observations which I had recently ventured to make public. It will be seen, however, that these agents do not separate it absolutely from the healthy tissues. If part of a lardaceous organ (for example, of the liver) be exposed to the action of water until all the albumen is washed out, and it be then treated with a dilute solution of caustic potash, an enormous amount of material is at once extracted, which, on the action of an acid, will appear as a white flocculent precipitate, soluble in alkalies, but not by their carbonates, and precipitable by acids. The tissue which has yielded it no longer presents the "amyloid" reaction, and it is an obvious inference that the matter which has caused this has been dissolved out. But, as the same process extracts a less abundant but similar material from the tissue of health, the lardaceous matter is not to be isolated by this means; but it is so much more soluble than the normal structures, that it is probable that the process can be so managed as to extract the one with but little of the other. In the matter thus extracted by means of potash, Dr. Marcet found 13.7 per cent. of nitrogen as the average of three estimations; that of albumen being 15.7.

The observation that a lardaceous organ, if washed with alkali, ceased to exhibit the lardaceous reaction, led to an inquiry into the mineral constituents of the morbid deposit. Taking the liver as best suited for the purpose, the alkaline and earthy salts were ascertained in 100 grammes of liver-tissue, as removed from the body.