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REMARKS

ON

CERTAIN VASO-MOTOR NEUROSES.

Delivered in Connexion with the Edinburgh Post-Graduate Lectures for 1888.

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In the following remarks it is my purpose to direct your attention to an interesting series of symptoms which have their origin in alterations of the functions of the vaso-motor system, and which, taken together, form an exceedingly definite group of phenomena. The clinical aspect of the facts to be laid before you will receive the largest share of our notice; it will, nevertheless, be necessary to recall at times certain points in regard to the physiological considerations involved in a study of this nature. It will, moreover, tend to a clear understanding of the subject in all its relations if a brief glance be cast, in the first place, upon the normal functions of the vaso-motor system, before we attempt to form any opinions in regard to the changes which they undergo in disease.

The vaso-motor system consists of centres brought into relationship with the vessels by means of the vaso-motor nerves. Many different parts of the spinal cord contain vaso-motor centres, but they appear to be under the influence of one dominating centre for each lateral half of the body. The position of this centre in the rabbit is in the floor of the fourth ventricle, about two or three millimetres from the middle line, reaching from about one or two millimetres below the corpora quadrigemina to four or five above the calamus scriptorius. In this position it is, as you may readily imagine, in very close connexion with a number of other important centres. It is intimately associated, for example, with the inhibitory and accelerating centres for the heart; with the different parts of the respiratory centre, as well as the allied centres

for coughing and sneezing; with the centres for the reflex actions of the lips, mouth, pharynx, and salivary glands; with the vomiting centre; with the centre controlling the sudoriparous glands; and, lastly, with the upper centre for the dilatation of the iris, and that controlling the movements of the eyelids. The proximity of these various centres, and their intimate relations, render it easy to understand why poisons which act upon the medulla cause such varied effects, and why certain diseases, which directly or indirectly affect this region, produce symptoms so wide-spread and far-reaching.

Under ordinary circumstances, the vaso-motor centres appear to be in a condition of medium tonic irritability; stimulation, whether immediate or reflex, induces contraction of all the arterioles, with an increase of blood pressure, while depression, either direct or indirect, causes dilatation of these vessels throughout the body, with a diminution of the arterial pressure.

Amongst influences which directly affect the vaso-motor centres must be mentioned, in the first place, the condition of the blood in regard to its contained gases. When the blood circulating in these centres has a free supply of oxygen, they remain in a state of moderate irritability, and the arterioles are dilated; but if, on the contrary, the oxygen is deficient, the irritability increases, and the vessels are thrown into a condition of contraction. As a familiar illustration of this fact, it may not be out of place to recall the well-known circumstance that the empty condition of the arteries after death is the result of the venosity of the blood, which has caused such a contraction.

The only other agents directly affecting the centres to which reference need be made in this place are drugs, and of these no more requires to be said at present than the fact that strychnine may be regarded as the type of those substances which excite the centres and produce a rise of arterial tension through contraction of the arterioles, while amyl nitrite may be taken as a good example of the opposite group.

Indirect agents causing changes in the irritability of the centres produce their effects reflexly, by means of two sets of afferent nerves. There are, firstly, pressor nerves, which give rise to contraction of vessels and a rise of blood pressure through increase of the central activity. These nerves are brought into play by fall of external temperature, for instance, and many other causes. There are, secondly, depressor nerves effecting opposite results by means of diminished central activity. These are excited by heat externally, to mention a familiar example, as well as by other circumstances.

It seems highly probable that in addition to the vaso-motor, or, as they might be called, vaso-constrictor centres, there are vaso-dilator centres with special nerves. This question, however, cannot be regarded as sufficiently definite to afford a basis for the explana-

tion of clinical phenomena, yet it appears to be far from improbable that many conditions characterized by vascular dilatation may have their origin rather in excitement of such vaso-dilator, than in depression of the vaso-constrictor centres.

Before leaving these preliminary considerations, let me once more refer to the close proximity of the medullary centres. The fact of their being in this direct contact gives an easy explanation of many associated symptoms such as we are about to consider; for, as may readily be understood, if a powerful degree of excitement is induced in one centre, it tends to spread into neighbouring areas of nervous activity. Perhaps the most familiar example of this fact is to be found in the common circumstance, to speak of other centres in passing, that in diseases attended by prolonged coughing there is a great tendency to the production of vomiting towards the end of the fit of coughing.

Turning now from such preliminary considerations to the subjects which are more particularly to occupy our attention, let me, in the first place, bring under your notice some clinical phenomena depending upon an increase in the irritability of the vaso-motor centres. It is well known that at the outset of acute diseases there is usually profound excitement of these centres, manifested by such general symptoms as pallor of the surface caused by contraction of the vessels, and associated with a sensation of cold attended by shivering. It is quite outside the sphere of this lecture to dwell upon such vaso-motor changes as we find in fevers and inflammations, but it will certainly make my aim clearer if you will allow me to make such passing references as this.

Among phenomena caused by excessive action of the vaso-motor centres, we may glance at certain effects produced upon the skin. In patients of neurotic tendencies it is extremely common to find patches of pallor upon the surface contrasting strongly with the healthy skin, and very frequently such patches occur in areas which are deeply flushed. On the forehead, cheeks, and neck, there may be pale and flushed patches mutually bounding each other and sharply defined. When such is the case, other nervous phenomena are present in addition to the contraction and dilatation of the vessels. Of such attendant symptoms, perhaps the most common are dilatation of the pupils and palpitation of the heart, telling the tale of medullary excitement. Cases have not infrequently come under my notice in which a carious tooth or an astigmatic eye has produced long continued phenomena of such a kind.

One of the most frequent, as well as most striking, results of vascular constriction from vaso-motor excitement is to be seen in hemicrania or migraine. This condition, in the fully developed form or in lesser degrees, frequently follows some affection connected with the eye, or ear, or mouth, and speaks of irritation of the sympathetic nerve produced reflexly through the medulla, and shown

by several associated symptoms. There is the severe pain caused by deficient nutrition of the nerves from vascular constriction, and pallor of the surface due to the same condition, while the dilated pupil is evidence of excitement of the medullary centre for the movements of the iris, and the emesis which follows is proof of irritation of the vomiting centre. But it must not be forgotten that hemicrania may be the result of other changes than those just referred to, and the cause of the affection can only be arrived at by careful study of the various symptoms present. Most of the cases of migraine, however, which have fallen under my own observation have had their origin in conditions similar to those just described. Astigmatism or some other faulty state of the vision has most commonly been at the root of the malady, and it is of interest to mention that in the course of the onset, pain has commonly been complained of, not only at the base of the skull posteriorly, but also over the cilio-spinal region, that is, over the lower cervical and upper dorsal vertebræ. In some of these instances the patients have learned to regard the pain over the spine as the herald of an attack of migraine.

Let me next refer briefly to a much more serious condition—the malady known as angina pectoris. This affection is the result of various pathological changes, and its mode of production is therefore somewhat diverse. But in this place the only form of angina pectoris which can be discussed in this connexion is that which depends upon irritation of the vaso-motor system, the affection known in Germany as "angina pectoris vasomotoria." In the typical form of this affection there is high arterial tension, which alone is enough to distinguish it from almost all other forms of angina pectoris, with pallor and coldness of the surface and an excited frequent pulse, caused by the struggle to overcome the obstacle to the passage of the blood into the capillaries which results from the contraction of the arteries throughout the body. It might be expected that the pulse should be infrequent with high tension, but it must be remembered that in all true cases of angina pectoris the heart is enfeebled. At times the vascular contraction may be local, but in by far the larger number of cases the arterial spasm is general.

Brief reference may be made to the means by which the excitement of the vaso-motor centre and the spasm of the vessels may be removed. For rapid effects, as you are all aware, no drug is to be compared to nitrite of amyl administered by inhalation, and for slower but more lasting influence nitro-glycerine is equally reliable, while spirit of nitrous ether is in many cases a most useful preparation in the affections we have been considering. The tropeïne series of drugs must not be passed over in silence, as belladonna, stramonium, and hyoscyamus, as well as their alkaloids, possess considerable efficacy in such cases, and lobelia and tobacco may be found of use in certain instances.

We may also fall back upon chloral and several products of distillation, especially chloroform and ether, if any of the substances just mentioned cannot be employed in the treatment of such affections.

In the next place, there are symptoms arising from depression of the vaso-motor centre which now claim our attention. Such symptoms, as has already been hinted, may possibly be found in the future to depend upon irritation of vaso-dilator centres, but at present we can only explain them by reference to the vaso-constrictor apparatus. We shall, in the first instance, consider those belonging to the cutaneous and subcutaneous tissues. Passing reference was made to the fact that in the initial stage of acute general diseases there is usually a tonic constriction of the vessels of the surface of the body, attended by cold and pallor; and it should be mentioned here that this stage is followed by a dilatation of these superficial vessels, associated with heat and redness. The contraction is caused by irritation of the vaso-motor centre, and the dilatation by depression.

Patches of flushing were incidentally referred to in the remarks made upon the occurrence of blanched areas. Such association of pale and ruddy patches evidently depends upon an irregular excitement of the different parts of the vaso-motor centres, whereby certain of the nerves supplying the vessels are set into violent action, while others are profoundly depressed. In a few rare cases local perspirations follow flushing of areas of the skin, and in such instances there must be some excitement of the nerves supplying the sudoriparous glands.

But much more definite appearances than these are common upon the surface of the body from vaso-motor action, and associated with various nervous disturbances there may be different results of cutaneous hyperæmia. Patches of erythema, or of prurigo, or of urticaria, may be developed in a fugitive manner, and the chief point to be noticed is that there is a great tendency towards the association of these diverse forms of disorder in the same person and at the same time.

The subcutaneous textures are perhaps even more frequently involved than the skin in vaso-motor disturbances, and local œdemas of the arms or legs form an extremely common symptom of such disorders. Considerable pain is often the result of such conditions, on account of the pressure exerted on the sensory nerves of the affected regions by the fulness of the parts.

Vaso-motor influences frequently cause changes in the internal organs, and you will perhaps allow me to lay before you a few facts bearing upon cases of this nature. In doing so, only affections which may correctly be termed neurotic can be referred to, as it would be beyond the province of these remarks to transgress further.

Cases of vaso-motor neuroses affecting the lungs have come

under my notice. In such instances, sudden pain and breathlessness have called attention to the thoracic viscera, and the rapid development of a muffled percussion sound, and crepitations on auscultation, have led to the apprehension that pneumonia was impending. The temperature has in such cases, however, been nearly if not quite normal, and a few hours have seen the disappearance of every pulmonary symptom.

In the case of the abdominal viscera, similar conditions are even more striking. You know that a very large quantity of blood may be contained in the intestines when the splanchnic nerves have been divided, and in neurotic patients effects entirely analogous to the changes produced by section of these nerves are caused by disturbances of the vaso-motor system. In such cases it is permissible to speak of splanchnic paralysis. Its results manifest themselves by swelling of the abdomen, distinguished from flatulent distension by the want of resonance on percussion; and this enlargement is often attended by pallor and coldness of the whole surface of the body, along with empty arteries, which may be almost pulseless. In cases of this nature, as in neurotic affections of the thoracic viscera, the symptoms commonly vanish as speedily as they appear.

A more common symptom, however, of neurotic troubles is what is known as nervous diarrhœa. This is frequently to be observed in hysterical patients, but it also occurs in persons of neurotic tendencies without hysterical disturbances. The first case of the kind which came under my notice was a gentleman, who assured me that he was unable to attend church on account of this symptom. From personal knowledge of the vicar of his parish, it seemed to me that the patient was malingering in order to avoid the tedium inseparable from attendance on his ministrations, but wider experience has convinced me that this suspicion was unjust. Many cases of the kind have since been under my observation, and the point common to them all has been that the diarrhœa invariably came on when the patient was at some meeting. It is, perhaps, more common among nervous schoolboys than any other class.

Upon the connexion existing between the vaso-motor nervous system and the urinary secretion it will be proper to say a few words. If the renal nerves, which enter the kidney by the hilus, are divided, there is apparently dilatation of the afferent vessels going to the glomeruli, followed by an increase in the quantity of the urine. It is further known that there is a point in the floor of the fourth ventricle, in front of the origin of the vagus, injury to which gives rise to the condition termed hydruria.

It is hardly necessary to refer to the well-known fact, that disturbances of the mental processes cause changes in the amount of urine; such emotions as fear, for example, cause effects similar to those produced by cold externally; in both cases the superficial vessels are contracted, and the quantity of urine undergoes a great

increase. The same effect is also to be observed as a symptom of various neuroses, no doubt dependent upon central disturbances, and usually associated with other nervous phenomena.

But beyond such renal symptoms as those just described there are others of more importance. Albuminuria in young persons of both sexes, who inherit nervous tendencies, is not by any means uncommon. It has been explained in many ways, and, no doubt, may be caused by several different conditions; as it is, however, frequently found in patients who have no apparent disturbance of the nutritive processes, but who present signs of nervous disorder, the conviction has been forced upon me that the appearance of albumin in the urine is in not a few cases the result of vaso-motor influences.

Amongst the agents at our disposal for stimulating the vaso-motor system, strychnine deserves a high place, and its employment is in most cases followed by immediate benefit. But digitalis and the drugs which possess a similar action may be used with advantage, because they also produce a considerable degree of stimulation of the vaso-motor mechanism.

You will perhaps allow me to say a few words in regard to the connexion of the vaso-motor system and glycosuria. It is hardly necessary to refer to the fact that injury to the centre of the vaso-motor nerves of the liver (the so-called "diabetic puncture") produces glycosuria. And it is almost as unnecessary to remind you that when the vaso-motor nerves which supply the liver are divided, glycosuria is also produced. In both of these experiments the liver becomes hyperæmic, the circulation in that organ is modified, and, in consequence of this, the hepatic cells can act with greater effect upon the glycogen; they, therefore, produce an excess of sugar.

But there are other facts not quite so well known, which you will perhaps allow me to mention briefly. There is, for instance, the fact that when the splanchnic nerves are cut, after glycosuria has been produced, the sugar is reduced in quantity or disappears entirely. This is probably caused by the reduction in the quantity of the blood circulating in the liver, which follows the dilatation of the abdominal vessels consequent upon the division of the splanchnic nerves. And it must also be remembered that when the central end of the divided vagus, or depressor, or even sciatic nerve is stimulated, sugar appears in the urine—a fact which throws light upon the well-known clinical phenomenon of glycosuria following injury to distant nerves. In such cases the effect is a reflex one, and is undoubtedly produced through the vaso-motor mechanism.

The effect of such drugs as opium and codeine, which lessen the amount of sugar in glycosuria, is to be explained chiefly by their action upon the centres in the medulla.

In many patients we find several of the symptoms which have

been described linked together. We may observe, for example, in a patient who has a troublesome ear affection, a severe attack of migraine, associated with patches of erythema, and followed by polyuria. Or, in another case, there may be some error of the visual mechanism, causing pain over the cilio-spinal portion of the back, attended by local œdemas and a turgid abdomen, and ending in a free flow of fluid from the intestine. But in many cases several similar phenomena may exist together, apparently unconnected with any definite cause, such as, for instance, an affection of the special senses. In many of these patients, whether male or female, there will be found painful spots over the vertebral column, and for all such cases the application of iodine, or a blister, or the actual cautery over the spine, will be found beneficial, along with the continuous current from the medulla to the feet and hands, and the use of tonic remedies.

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