ON STRUCTURAL DISEASES INDUCED THROUGH THE INFLUENCE OF THE NERVOUS SYSTEM.*

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THE discussion which I have been requested to open concerns questions of unusual difficulty. The determination of the share which the nervous system takes in the production of structural disease is difficult, partly on account of the extremely complex functions of the various parts of that system, and partly because nerve-tissue itself is liable to many and various forms of organic disorder. With diseases of the nervous system itself we have, on the present occasion, nothing to do; but, as I shall have to show before long, it is very easy to mistake, for a result of disturbance through nerves, certain symptoms which are probably produced by degeneration or inflammation of the nervous structure. Let me here say, I consider myself unusually fortunate in having to open this subject under the presidency of one to whom we owe some of the earliest and most suggestive teaching respecting it. It was from Sir James Paget's lectures at the College of Surgeons, twenty-five years ago, that my earliest interest in the subject dates; and I have no doubt that the same is the case with others present.

One of my chief difficulties consists in the very limited amount of time at my disposal, and I must urge this as my excuse if I pass hurriedly over many subjects well deserving of careful attention, and especially if I appear to speak with too much definiteness on some concerning which there is, as yet, much doubt. That I may not waste time with further preamble, I will proceed at once to the statement of certain general propositions which are in a certain sense preliminary.

We may, I think, consider that there are two schools of opinion in reference to this matter: one which holds, or did hold, that the phenomena are all to be explained by reference to the function of the vaso-motor nerve; and the other which believes this method inadequate, and teaches that the nervous force has a direct control over nutrition, in addition to that which it exerts by regulating the supply of blood. An advanced section of this school holds, with Samuel, that there exist special nerves having their own centres for the function of nutritional control, and gives to these the name trophic nerves. The hypothesis of trophic nerves is at first sight tempting, on account of its easy application to the phenomena. We have but to suppose that there exist, ready for action, certain nerves which, by virtue of their own endowments, can cause now a herpes vesicle, and now a patch of gangrene of the skin, which can make a bone brittle or induce an exostosis, cause the cornea to ulcerate in one case, or the iris to inflame in another—and without doubt our pathological labours become much lightened. Yet is there not something in this almost fatal facility of application which should induce us to receive the hypothesis with much scepticism? Can it, indeed, be said to explain anything? Does it not rather take everything for granted, giving no real explanation in any one direction? Surely we ought to wait until either the experiments of physiologists or bedside observations compel us to say that no other hypothesis is adequate, before we adopt that which, in such a free and easy manner, invites us to swallow camel and gnat together.

I by no means wish to be dogmatic, or in any way to invite you to prejudice the question; but it may be convenient here to admit that a main drift of the remarks which I am about to bring before you will be to try how far the various phenomena of disease which have been believed to support a theory of the direct influence of the nervous system upon nutrition may be explained in other ways. In doing this, it will be necessary to attribute much to the known functions of the vaso-motor nerve, but by no means all; and I shall have to make frequent reference to the probability that some of the conditions are to be counted as diseases of the peripheral nerve-structures, rather than as induced by central agency.

Amongst the facts which seem to me to discredit the hypothesis of trophic nerves, and of direct trophic influence as a nerve-function, are the following: The great rarity of some of the diseases which are supposed to illustrate it; the very peculiar features of some of them; their remarkable differences one from another; the close resemblances between most of them and certain other diseases which there is no reason to suspect of being of neurotic origin.

I will enumerate some of the principal disorders which have been supposed to be due to nerve-influence: Bed-sores in the paralysed;

cystitis in the paralysed; ulceration of the cornea in paralysis of the fifth nerve; sympathetic ophthalmia and neurotic iritis; herpes zoster and other forms of herpes; glossy skin after injuries to nerves; arthritis after spinal disease or injury; *digiti mortui* and "symmetrical gangrene of the extremities"; morphea and allied forms of scleriosis cutis; disorganisation of joints in locomotor ataxy; brittle bones (*osteo-malacia*) in the insane and in disorders of the nervous system; disturbances of nutrition of the skin and bones in leprosy.

Before it is possible for us to say whether or not the nervous system can take a direct share in disturbing the nutrition of distant organs or parts, it is necessary for us to determine, as clearly as we can, what are the limits of its power, in the exercise of those of its functions which are universally admitted.

Under this head, we must bear in mind the following facts.

That, apart from its functions in reference to ordinary motion and sensation, the nervous system can, in the most definite manner, regulate the supply of blood and influence secretion. In this regulation of the supply of nutriment to distant parts, the sensory nerves act as the incident exciters; and thus it may easily appear as if they possessed a direct control over the processes of nutrition. Let me refer to a drawing in Mr. Hilton's valuable *Lectures on Rest and Pain*, which shows the condition of the hand in a woman of whom the brachial artery was occluded, and the ulnar nerve irritated. You will see that the tips of the ring and little fingers have passed into dry gangrene, and that of the little a larger part is involved than of the other. Now, the ulnar nerve was in this case irritated by the pressure of an exostosis, and, at first sight, we might appear to have proof of the direct influence of the nerve in nutrition, and of its power when paralysed to cause gangrene. But there are other facts to be explained, and other suggestions to be made. The case was one in which the brachial artery was occluded, and thus the whole hand received a poor supply of blood. Under these circumstances, is it not easy of belief that the irritation of the ulnar nerve may have caused vaso-motor spasm, and thus added to the anæmia already existing in the two fingers concerned? That which ischaemia from nerve-irritation might be quite inadequate to produce under normal conditions, might become quite possible when the main artery was previously blocked.

I confess that I feel unwilling to admit that nerves possess any direct power over tissues which, by an influence transmitted peripherally, and without reference to blood-supply, can determine gangrene. Exactly the same suggested explanations may be given in the case of *digiti mortui*, of symmetrical gangrene of finger-tips, in which the nerves take an undoubted share in the production of the phenomena. I ask, then, that, in these and other instances, we may carefully keep in mind the power of sensory nerve-fibres as incident exciters, in their special special territories, of the vaso-motor filaments, and thus as the causes of ischaemia.

REMARKS ON SOME OF THE PHYSIOLOGICAL AND PATHOLOGICAL INFLUENCES OF THE NERVOUS SYSTEM ON NUTRITION.

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LIKE Mr. Hutchinson, I also owe a great deal of my interest in this subject to Sir James Paget's lectures at the College of Surgeons. I had, however, some time before these admirable lectures were published, come to an opinion, which I still hold, and which is different from the two doctrines mentioned by Mr. Hutchinson. I believed then, as I do now, that the nervous system can, in various ways, either for good or harm, interfere with nutrition; but that its influence is not essential to nutrition, except in this indirect way, that the performance of the function of certain parts (such as contractile tissues) is useful to their nutrition, and that their function depends on the nervous system.

Being the originator of the vaso-motor doctrine, I naturally feel rather inclined to attribute to the vaso-motor nerves a large share in normal and altered nutrition. This, however, does not prevent my recognising that there are other influences of the nervous system on nutrition than mere contraction and dilatation of blood-vessels. Let us take gangrene as an instance of an effect of a nervous influence. There are clear, positive facts showing that, sometimes at least, this sloughing of tissues is caused by something else than a mere cessation of circulation due to vascular spasm or to any other cause. I have seen a bed-sore beginning on the sacrum of a dog, seven hours after having produced an inflammation of the spinal cord. The skin at that place was violet and completely gangrened the next day. Sir Benjamin

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