POST-NASAL CATARRH AND DISEASES OF THE NOSE CAUSING DEAFNESS

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CHAPTER I.

INTRODUCTORY OBSERVATIONS ON THE CORRELATING AND REFLEX FUNCTIONS OF THE SYMPATHETIC SYSTEM.

A BRIEF introductory outline of the physiological basis upon which the following studies is founded, will enable the reader to follow these with greater advantage, and also render unnecessary the repetition of details which would otherwise be required to make clear the subject under review.

It will be seen that the diseases and lesions about to be discussed, have their point of departure in certain modifications of nutrition in the regions implicated, and that these are followed by alterations of function in the local mechanism involved.

The term "modifications of nutrition" includes all the processes of inflammation whether acute or chronic; as well as some hypertrophies of tissue which are either congenital, or originate shortly after birth.

The particular conditions which mediate these changes will be seen to possess a *uniformity of type*, and my object will be to differentiate these by tracing them as far as may be possible to the initial stage of the process in each.

The significance of the term just made use of, "uniformity of type," will be obvious from the considerations which follow. From these it will be seen that the modifications of nutrition to be examined, are all of them traceable to an anatomical mechanism normally operating in the healthy

economy, and represent exaggerations of normal work on the one hand, or repressions of this healthy action on the other.

The resultants of these modifications will vary according as the exaggerations or the repressions are sudden and transient, or, as they are slow and prolonged. The element of *intensity* in either direction, is an important one in determining the issue.

The *anatomical mechanism* to the consideration of which these remarks lead, will be found in that portion of the nervous system constituted by the *ganglia of the sympathetic* chain and its afferent and efferent branches. By far the most important fact in connection with the sympathetic system is, that with one or two exceptions all sensori-motor nerves include fibres belonging to it; these sympathetic fibrillæ proceed to their companion cerebral or spinal nerve from that ganglion which is nearest to the latter when it issues from the spinal canal, or, that join it from ganglia near which it passes in its course.

These sympathetic fibres are *afferent* in their function as regards the ganglion, *i.e.*, they convey impressions *from the tissues* to which they are distributed, to the ganglion; or, beyond it to centres within the spinal cord. They may be looked upon as taking this ganglion in their course to the general vaso-motor centre hypothetically seated in the medulla oblongata; but it must not be forgotten that when these fibres thus enter a ganglion they communicate with its caudate cells. This important fact brings them into communication with another set of nerves coming from very different directions to the same ganglion. When these afferent sympathetic fibres pass out of the ganglion they do so by one of the two fasciculi or roots connecting it with the spinal cord, in which they are prolonged to the primary vaso-motor centre. The exact seat of this latter has not been determined for the human subject, though accurately fixed in the rabbit.

It is necessary to emphasize the fact of the organic communication of these afferent sympathetic nerves with the anatomical elements of the ganglion through which they pass, because this arrangement gives to them a terminal significance as regards some part of their functions, and places the ganglion in the light of a centre with reference

to these functions, the full meaning of which will shortly become apparent.

The second set of fibrillæ referred to as entering the ganglion proceed by a similar course *from* the general centre, also along the anterior columns of the cord, which they leave opposite an intervertebral foramen to join a given sympathetic ganglion, thus constituting its second root. These, similarly to the preceding afferent fibrillæ, mingle with the intrinsic caudate cells of the ganglion, after which they quit it to seek their several destinations on the *coats of the arteries*. They are *efferent* or centrifugal in their function, conveying impressions from the general centre or the sub-centre constituted by their ganglion, to the arteries, whose calibre it is their function to regulate. Hence they are usually designated "vaso-motor" nerves.

This nomenclature, though useful to indicate the particular property of a section of the sympathetic system, is not without its disadvantage, as tending to isolate and individualise a function by assigning to the efferent members of the scheme an office which is undoubtedly shared between both afferent and efferent fibres. Because, and this is the main contention of this thesis, both elements of the system are in reflex relationship with one another, and that by means of this relationship established as has been shown by their organic communication in the ganglia, tissue impressions are conveyed along one set of fibres to the ganglion, which are reflexly transmitted from it along the efferent channels to the vessels, whereby the blood supply is meted out according to the impressions communicated.

Probably it will be found a not incorrect inference to regard these centres whether primary or secondary as after all playing a subservient part to the tissues which animate them. From this point of view they will be reduced to the level of stations for receiving and transmitting impressions originating in the vital work of the areas with which they communicate, and therefore devoid of any power of originating such impressions, though they do undoubtedly modify the impulses passing through them, according as their vigour or vital energy, is less or more than normal. In the former case we get the phenomena of paresis, of a central or sub-central origin.

Apart from this consideration, however, and as the re-

sult of the study of numerous morbid conditions involving the sympathetic apparatus as a whole, I have been led to conclude that the sympathetic ganglia not only play the part of secondary centres or sub-centres, receiving and transmitting impressions *quite independently of the general centre;* but that they are also *correlating organs* by means of which afferent tissue impressions from one direction are reflexly referred to a totally different tract, where they find expression as modifications of vessel-calibre in that tract; the afferent impressions being manifested through their medium as efferent impulses in the area to which they are thus reflected. In other words, the sympathetic ganglia are to be regarded as so many stations situated on the lines traversed by vaso-motor impressions, in which the "points" so to speak, are managed, and by means of which, impulses are transferred from one line to another. Or, to borrow another analogy from the now familiar domain of electricity, these ganglia whether primary or secondary act as accumulators of force generated in the vital processes of the tissues, whence it is distributed along lines also communicating with these reservoirs, and which transmitted force expresses itself in alterations of arterial capacity.

Thus it becomes apparent that the sympathetic system as above sketched constitutes a mechanism for regulating the blood supply of the tissues, and consequently its members formed by the afferent and efferent nerves with their ganglionic centres, constitute the real and only media by which *trophic* changes are accomplished in the animal economy. This mechanism I submit suffices to cover all the work done in this domain.

The inextricable confusion, which has hitherto surrounded the subject of trophic nerves, and which is seen in all writers alike, arises from the failure on their part to recognise the true *reflex* relationship existing between the three members of the system. Vivisection experiments and observations of morbid phenomena, the only true bases of correct inference, though affording all the elements of proof, have hitherto given no clue to the situation because of this oversight.

Perhaps the commonest illustration of the confusion of ideas on this subject is shown in attributing to certain