Putnam (J. J.)

WERNECKE ON THE THEORY OF APHASIA.

AN ABSTRACT.

By JAMES J. PUTNAM, M. D.,
OF BOSTON.

[Reprinted from The Boston Medical and Surgical Journal, May 20, 1875.]

SURGEON GEN'L'S OFFICE
264
LIBRARY

SURGEON GEN'L'S OFFICE
LIBRARY

WERNECKE ON THE THEORY OF APHASIA.

AN ABSTRACT.

BY JAMES J. PUTNAM, M. D., OF BOSTON.

THE group of symptoms which are seen in certain typical forms of the mysterious disease aphasia has recently received, at the hands of Dr. Wernecke,[1] of Breslau, a careful and scientific analysis, which is the more important because he has been able to find for his theoretical statements a substantial anatomical basis, thanks mainly to the fruitful labors of Professor Meynert, of Vienna.

The interest of the subject will justify this brief sketch of a work which, although clearly and charmingly written, is itself almost too concise.

An accurate conception of the physiology of conscious speech is best obtained by studying the origin and growth of consciousness and volition themselves, in the history of the development of the new-born child; for in its earliest manifestations of life they seem to take no active part. For the amount of muscular coördination required in the infant's first inarticulate crying, for example, even the machinery of the medulla oblongata alone, inherited ready for action, appears sufficient: the raw material of consciousness has yet to be supplied in the form of impressions from without, which it is the first function of the cortex cerebri (the future seat of conscious life), at birth a tabula rasa, to receive, and store up for future use. These centripetal impressions, destined for the cortex cerebri, fall into two distinct classes. The first class consists of the excitations coming through the various sensitive nerves of the body, and serving at once to excite reflex actions, of greater or less complexity, through the agency of the different central ganglionic masses, and to produce in the cortex cerebri the changes of which conscious sensations form the subjective side; the second class consists of the excitations arising in the ganglionic masses alluded to as reflex centres, and through them a picture is carried to the cortex cerebri of the processes in these centres by which the various reflex movements of the muscles are called out, such as play so prominent a part in the early life of the infant. These pictures, the reflection of the nervous processes

[1] Der Aphasischer Symptomencomplex: eine psychologische Studie auf anatomischer Basis. Breslau. 1874.

which underlie the child's first involuntary movements, constitute the subject-matter of conscious motor ideas, soon to reappear, in modified form, as voluntary motor impulses, which are in reality the echoes of past involuntary acts.

There is reason to believe that the former of these two classes of impressions — the sensory — is conveyed to, and stored up in, the posterior (and temporal) regions of the cortex cerebri; the latter — the motor — in the anterior regions of the cortex.[1] Instantly on the occurrence of the inarticulate cry, for example, a certain part of the cortex of the infant's brain (probably of the temporal lobe) receives an impression corresponding with a conscious auditory sensation, and at the same moment the cortex of the frontal lobe receives a second impression (motor idea), which is the correlate of the coördinated muscular movement by which the sound was produced (both being expressions of the activity of certain reflex ganglionic masses at the base of the brain). At the next step in the process, these impressions, and the corresponding conscious ideas, become associated together (by means of fibrous tracts whose existence can be demonstrated), and associated also, in the first place, with other sensitive impressions, corresponding, perhaps, with the causes that gave rise to the cry. In this way a chain of associated impressions is created, the excitation of any link of which may in future cause this same cry to occur, the motor impulse arising now not in the ganglia at the base of the brain, but in the cortex cerebri and bearing the stamp of consciousness and volition. The number of these associated sensitive impressions goes on increasing with immense rapidity, representing the growth of consciousness in the direction of causation.

This primary comparatively simple manifestation of conscious life soon inevitably becomes complicated in a new direction: at the same time with the sensory ideas, the number of associated motor ideas (*i. e.*, of possible voluntary motor impulses) is constantly increasing, so that, to revert to the previous example, on the recurrence of any one, the excitations which provoked the cry, ideas of crying, laughing, and of many other acts may be called up in consciousness, and that motor idea will finally prevail as a voluntary motor impulse, which is associated with the largest number of similar sensitive states of consciousness, or most intimately with any one of them, etc.; in other words, that which corresponds the best with the external influences to

[1] The grounds for believing that the anterior lobes of the brain are motor, the posterior sensory, in their functions, lie mainly in the fact that the former are found, anatomically and pathologically, to be intimately associated with the motor, the latter with the sensitive, peripheral nerve-tracts; while, moreover, it has been shown (Hitzig, Ferrier, etc.) that by carefully localized excitation of certain parts of the surface of the frontal lobes, crossed muscular movements can be called out. Betz has furthermore found in the cortex of these regions ganglion cells of unusual size, which he considers to be the analogues of the motor cells of the spinal cord.

which the child has been subjected. With the ever-multiplying number of associated ideas, however, some delay will now inevitably intervene between the arrival of the excitation at any one point in the chain of associated sensory impressions on the cortex cerebri and the occurrence of one out of the many possible motor results; and in this delay, during which a number of sensory and motor ideas are being simultaneously or successively aroused in consciousness, one of which finally prevails over the rest, we see the physiological side of reflection, determination, action. It will thus be seen that every cerebral process, even one so complicated as that involved in conscious speech, is in fact a reflex process, though one of a high order; in other words, that every voluntary impulse must have been preceded at some time by an excitation arising outside the cortex cerebri.

It is plain that in learning to talk, a child (unless deaf) depends for its sensory impressions upon excitations coming through the auditory nerves; it tries to reproduce the words it hears, running over its small stock of sounds until, by exclusion, it finds those with which the ear rests comparatively satisfied, long before it learns to associate them with the tactile and visual ideas whose presence is necessary to a complete conception of the thing which the words represent. Even when, at a later period, the names of things awaken a far-reaching train of associations in the mind, and speech represents something more than a jangle of sounds, still the strong association between the auditory and the motor ideas persists, the corresponding centres in the cortex cerebri are apt to be innervated in concert. When we think in words, the auditory centre is faintly excited, as well as that for speech; and when we express our thoughts, this innervation of the auditory centre also occurs, and exerts a controlling influence over the motor impulses that result in speech, an inappropriate motor impulse failing to arouse the auditory conception corresponding with the idea that we wished to express. Besides thus controlling speech, our auditory sense enables us to appreciate through the ear, and to correct, mistakes that we may chance to make in our spoken language.

With this amount of preface we may pass directly to consider the characteristic symptoms of aphasia in its different forms. Admitting for the moment the correctness of the reasoning given above, we can manifestly look for aphasic symptoms under either of the following three conditions: —

1. The *auditory centre* may be injured in such a way that the sound of words, though still heard as sound, is no longer in the position to call up the associated ideas necessary to the complete conception of the things the words represent (sensory aphasia). In this case the patient loses his power, to a greater or less extent, of understanding words, — is deaf so far as conversation goes, — but retains his vocabulary intact,

and can use it in response to a visual or tactile excitation, although not with perfect correctness, because he has lost both the controlling and the correcting influence of his auditory centre. Cases of this class are rare, but Wernecke reports one of great interest. The patient, when asked, for example, to show the tongue, would look hopelessly around and make some inappropriate answer, but at the least sign from a by-stander would put the tongue out correctly.

The typical lesion is in the temporal lobe, adjacent to the fissure of Sylvius. There is usually no hemiplegia.[1]

2. The lesion may affect the *associating tracts*, which pass close under the island of Reil (association aphasia), between the auditory centre and that of speech: the patient retains his comprehension of the meaning of words, and his vocabulary; he loses the controlling influence of the auditory centre and uses words incorrectly, but retains the correcting power of the ear, and by giving time and pains to it can speak pretty correctly. Light cases of this class are seen with persons in health, who get confused in talking, and misuse or forget words. When the lesion is extensive, involving neighboring parts, there may be hemiplegia, or, from the nearness of the island of Reil to the optic commissure, hemiopia.

3. The *motor centres* (in the frontal lobes[2]) themselves may be affected (motor aphasia); in this case the vocabulary is almost lost, only "yes" or "no," or a few short phrases, remaining, which the patient uses under all circumstances, as a child cries, or a dog barks, under the irresistible impulse to use some form of vocal expression of the thoughts. This is the most common form of aphasia; there is almost always hemiplegia. The impairment of the delicate processes of coördination necessary to speech need not involve any appreciable interference with the other functions of the organs of articulation.

The degree to which agraphia (loss of the power of expression in written language) or alexia (loss of comprehension of written language) will occur in connection with these different forms of aphasia depends somewhat upon the previous education and habits of the patient. A child or an uneducated person speaks, aloud or to himself, as he reads and writes, and in his case the loss of the auditory centre would impair his proficiency in those respects. With a cultivated person, on the contrary, there may be an immediate association between the sight of a word and the conception of the thing, and he can read understandingly after the loss of his comprehension of spoken language. In spelling a written word, however, even the cultivated person must fail, for the sight of a single letter suggests no idea but that of its sound.

Apart from this, however, there is nothing in theory to prevent the

[1] Deaf-mutism is studied to advantage in this connection.

[2] Usually, as is well known, the left.

power of expression of words in writing from being retained even when the power of speech is impaired, inasmuch as the motor centres for writing are of course distinct from those for talking, and might be innervated by an auditory or visual impression on their own account. This sometimes in fact occurs to a greater or less extent, although but rarely, because the associating tracts between the auditory and these two motor centres lie probably in close conjunction and generally suffer together.

The author calls attention to the facts that pure cases of these varieties of aphasia, admitting of this exact diagnosis, are rarely met with. The most favorable time to examine them is after the disappearance of acute irritative symptoms, and before the occurrence of secondary morbid changes. Patients of the first and second class are sometimes taken for insane on account of their strange confusion of speech.

For many interesting details, anatomical, physiological, and philosophical, omitted of necessity in this brief sketch, the reader is referred to the original.

Attractive as these explanations are, they must be, and indeed are, admitted to be as yet crude and suggestive only.

The fact that the power of understanding words is lost in case of unilateral lesion of the auditory centre would oblige us to believe that the interpretation of sounds as words, like the origination of speech, occurs in one half of the brain alone, of course with the aid of either ear. At all events, however, the tenability of the following position must be admitted by all: to be conscious we must be conscious of something; if we think, our thoughts must take the form either of words, that is, the remembered images of words, spoken or written, or else of tactile, visual, or auditory images, — in other words, either of sensory or motor ideas. In the developed consciousness a thought is actually compounded of vast numbers of these sensory and motor ideas, associated together often in a net-work of infinite complexity, and any disturbance of this association must involve a disturbance of the thought and the result of the thought; for example, its outward expression in words: for, looked at physiologically, the existence of thought in the form of motor ideas means the faint excitation of those motor centres (centres for speech, etc.) whose stronger excitation induces the outward expression of the thought in word or gesture. Furthermore, there is every reason to believe that the original source of these excitations must lie, or have lain, outside the hemispheres of the brain.

It is the merit of this little book to have clearly applied this psychological reasoning to the study of the development of conscious speech, and to have shown (by facts of necessity omitted in this abstract) how the anatomical structure of the brain, so far as we have become acquainted with it, is, in certain respects, such as theory might have led us to expect.