ON A CASE OF AMNESIA.

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I HAVE submitted the notes of this case of Amnesia to my friend and former teacher, Dr. Charlton Bastian. He agrees with me in regarding it as one of great interest, and as belonging to that category which has been described by him as due to "damage to commissures between the auditory and the visual word-centres." In his work on "The Brain as an Organ of Mind" (3rd ed., p. 642) he has recorded a case of amnesia, in which some of the principal defects seemed to be due to a lesion producing functional inactivity of the two sets of commissural fibres naturally existing between the auditory and the visual centres. Two or three pages further on he refers to an important case published by Dr. Broadbent,¹ in which there appeared to be damage to one of these sets of commissural fibres only (viz. the visuo-auditory). Many of the peculiarities of the present case are to be accounted for on the supposition that here, amongst other things, we have to do with some damage to the other set of commissural fibres between these centres (viz. the audito-visual). My case is therefore the complement of that published by Dr. Broadbent.

Thus, in Dr. Bastian's cases the patients could neither read aloud, nor write from dictation; in Dr. Broadbent's case the man wrote well from dictation, but could not read aloud; in the present case, the patient could read aloud fluently, though he could not write from dictation.

In regard to the fluency with which my patient read aloud, it will be well to remember also a remarkable case recorded by Dr. Hertz.² "This patient," says Dr. Hertz, "was able to articulate distinctly any words which either occurred to him

¹ 'Med. Chirurg. Trans.,' 1872 (Case viii.)

² 'Psycholog. Mag.,' vol. viii.

spontaneously, or when they were slowly and loudly repeated to him. He strenuously exerted himself to speak, but an unintelligible kind of murmur was all that could be heard. The effort he made was violent, and terminated in a deep sigh. On the other hand, *he could read aloud with facility.*"

The patient whose case is here recorded was admitted into the Wolverhampton and Staffordshire Hospital, under the care of Dr. Millington, and I have to thank him for allowing me to publish the following notes.

John C., æt. 56, a brewer's drayman, was admitted on March 27th, 1884, complaining of having had a "stroke." He was rather more intelligent than men in his position usually are, and could read and write well, and keep simple accounts. He had suffered from attacks of gout for some time, but had never had any other illness. On March 25th he complained of headache, but went to work, and seemed in fairly good health. On March 27th he went out to work as usual, but came home at 8 A.M. "looking strange," and got into bed with his clothes and hat on. After a time he got up, and walked about the house in a "delirious" condition. He could speak plainly, but his right arm was weak, and he dragged his right leg slightly.

On admission.—He was found to be a strong, healthy-looking man; his temperature was 99°, and his face flushed. He complained of frontal headache, and of a "giddy feeling." He was conscious and rational, but his mind seemed somewhat confused and dull; the functions of the cranial nerves were carefully tested, and were all found to be normal except the facial, which was markedly paralysed on the right side. He protruded his tongue without any deviation. His speech was thick and slow; he only answered questions, and did not volunteer any statements.

Deglutition was normal.

Both arms could be moved, but there was marked weakness on the right side.

He could walk, but the right foot was slightly dragged. Sensation was not affected.

As regards reflexes, his pupils reacted well to light, and also

to accommodation, and were equal; the epigastric and plantar were well marked, but the cremasteric was absent on both sides. Knee-jerk could easily be obtained in both legs, but not ankle-clonus. There was entire control over the sphincters. His arteries were rigid and tortuous, and his pulse had rather a high tension. The heart was slightly hypertrophied, but no murmurs could be heard. The arcus senilis was well marked. The digestive and respiratory systems were quite healthy. Urine, specific gravity 1012; no albumen.

March 28th.—Patient is less intelligent than he was yesterday, and even partly unconscious; he recognised his master, but said nothing to him, and had a very dazed appearance.

March 29th.—Patient is semi-conscious: he says "Thank you" to every question. He does what he is told, but seems very confused and dull. He talks incoherently in his sleep. His right arm is now as strong as the left, but the right facial paralysis remains well marked.

April 3rd.—During the last few days patient's intellect has cleared up considerably; he says a few simple words, and appears to comprehend pictures. He sometimes complains of headache, localised about the left temple and left side of the forehead.

April 5th.—Patient can recognise pictures, but he cannot name the objects represented; he uses circumlocutory phrases; as, when shown a picture of a camel, he said, "Egypt long way." *He can copy writing, and can write from dictation his own name and such words as "cat" and "dog," but not more difficult ones.* He attempts them, but only makes a scrawl, though he occasionally gets the first letter right.

April 10th.—Patient is still improving; he can name a few simple objects. His grip, as tested with a dynamometer, is 50 on the right side, and 45 on the left.

April 15th.—Patient is still making progress—he can now read aloud easy words, but stumbles over the longer ones.

April 26th.—Patient *can now read aloud very well*; he can copy writing and easy drawings, *but cannot write from dictation any better than on the 5th inst.* He is still unable to name the most common objects.

May 3rd.—Patient can now write a very fair letter asking

leave to walk in the garden, but cannot write the same words from dictation.

Remarks, with further details concerning Patient's condition two months after the attack.

This case is interesting, as being one of those which can be easily explained by Dr. Bastian's theory of Amnesia as set forth in his work on 'The Brain as an Organ of Mind' (3rd ed. pp. 600-690), to which and to his clinical lectures I am indebted for my information on this subject. Before considering the morbid condition present in this case, it will be advisable to describe the (theoretical) normal condition.

In our brains we may be legitimately supposed to have two centres, or cell and fibre mechanisms, which are specially concerned with the expression of our thoughts by speech and writing. The more important of these is called the "auditory word-centre," and in it are stored up, if we may so speak, the remembered sounds of words. So that when we wish to express our thoughts, the necessary words are revived in the auditory word-centre and are then uttered. That this is so, is evident from a study of the process of learning to speak; for during this period the child learns to associate, and does after many efforts associate, certain sounds which represent the name of an object with the object itself, and, later on, with the idea or remembered impression of that object. This theory is also endorsed by the fact that deaf children, who never hear word sounds, never reproduce them in speech.

The visual word-centre, in like manner, is concerned with the form or shape of the words and with their reproduction in writing. This I believe to be part of a larger "form" centre, which comprises and reproduces all visual impressions of form, size, colour, &c. That there is such a centre is, I think, indicated by the fact, that when we are trying to reproduce a sketch, we call up in "our mind's eye," as the saying is, a picture or remembered impression of the object, and copy this as we should copy the actual thing if it were present. Again, when we are in doubt about the spelling of a word, we often write down one or two variations and see which harmonises

most with our previously received impressions stored up in the visual word-centre.

Each of these word-centres may be stimulated to action in three different modes, viz. (1) by volitional impulses, as in spontaneous speech; (2) by associational impulses coming from the other centre, as in reading aloud and writing from dictation; and (3) by sensory impulses coming from the ear or eye, as the case may be, when repeating words or when copying them from a book. Each centre must, therefore, be supposed to be in relation with three ingoing sets of fibres.

In addition, each centre is furnished with outgoing fibres to the other centre; and with others going, in the case of the auditory word-centre, to the nerves supplying the speech muscles; and in the case of the visual word-centre, to those supplying the muscles used in writing: but before reaching these outgoing nerve fibres, the impulses are supposed to pass through a centre called the "kinæsthetic" centre, in which the sensations associated with different movements are received, and whose activity is supposed to help to regulate the execution of future movements of all kinds, including, of course, those concerned with speaking or writing.

Thus the auditory word-centre furnishes us with the words which we require in order that we may express our thoughts; and this, together with the kinæsthetic centre, furnishes, and in part regulates, the impulses to the various muscles concerned in speaking the words. In a corresponding manner, the visual word-centre would co-operate with its related part of the kinæsthetic centre, for the execution of the movements concerned in the writing of words.

As regards the relative importance of the auditory and the visual word-centres, the auditory evidently comes first, not only because speech is far more common than writing, but also because it seems likely that in health words are recalled in the visual word-centre only through the auditory word-centre; or if not entirely so, in very great part in this manner only. In the deaf and dumb, of course, the auditory word-centre is never developed, and words are revived only as visual impressions through the visual word-centre.

The position of these centres in the brain is considered by

Dr. Ferrier to be in the case of the visual in the angular gyrus, and in that of the auditory in the upper temporal convolution.

The centres may be damaged differently, so as to result in at least two kinds of defective action: (1) they may be paralysed, or (2) they may take on inco-ordinate action, *i.e.*, supply a wrong word instead of the right one.

I will now consider the modes in which we can (in accordance with a plan which I have learned from Dr. Bastian's lectures) test the efficiency of each centre, and apply them as I proceed to the case in question.

I. *Auditory Word-Centre.*

(1.) Is the patient's hearing good? This tests the condition of the sensory in-going fibres and of that part of the centre concerned with them. In this case the patient can hear perfectly well.

(2.) Can he understand speech? He comprehends everything that is said to him readily and well.

(3.) Can he speak? This tests the outgoing fibres and the portion of the centre connected therewith. But speech may be of three kinds.

(a.) Spontaneous: *i.e.*, can the patient express his thoughts as he wishes? Here, he can speak fluently and well, but cannot name objects (except a few familiar ones, and some which he has learnt since his attack). When asked the name of an object, he makes attempts to say the word, but cannot do so, and is quite conscious of his failure (paralytic amnesia). Sometimes, however, he says a word somewhat resembling the correct one in sound, as "spinnacles" and "stectacles" for "spectacles," or "rescern" and "concern" for "discern." At other times he will use a word, the meaning of which has a distant connection with the one required, as "mother" for "wife," and "brother" for "son"; or, again, he will use a periphrasis, as, when asked to name a camel, he said, "Egypt—a long way—go a long way—carry things—hot place." All the time he is quite clear as to the word he wants, and will recognise it immediately it is spoken, and will very accurately pick it out from a list of words resembling it in sound, or even from a list of synonyms.

Adjectives, verbs, etc., seem to present little or no difficulty, it being almost entirely noun-substantives that are unable to be recalled. Since the patient has been under observation he has learnt many names, and can recall others which formerly he could not do, and so has a fair vocabulary; but still he is constantly at a loss for a word in conversation.

(b.) Associational or mnemonic speech; or has the patient the power of repeating things from memory? This one has. He can count well, can say the alphabet, and can repeat the Lord's Prayer. In this case the bond of association or memory is so strong that it lasts uninjured after voluntary speech has been damaged, for the patient can say words under this influence that he cannot say voluntarily.

(c.) Imitative speech; or can the patient repeat words after you? This man at first could not repeat anything, but now he can repeat almost any simple word, with only an occasional difficulty. A very long word or a phrase he generally stumbles over more or less.

II. *Visual Word-Centre.*

(1.) Is the patient's sight good? If so, the in-going fibres are clearly intact; and in this case they are, as the patient can see perfectly well.

(2.) Does he comprehend printed or written words? He does very readily. He reads to himself very often, and obviously understands what he reads, since he can answer questions upon what he has been reading.

(3.) Does he recognise common objects? This man will recognise anything; can describe it, and knows all about it; but cannot name it.

(4.) Can the patient write? This tests the condition of the out-going fibres, and of the portion of the centre connected with them. Here, as in speaking, we have three varieties.

(a.) Can the patient write spontaneously? If so, the centre will respond to volitional impulses. In this case there is some defect, for although he can write simple sentences, he cannot write long or difficult ones, such as a description of an object.

(b.) Can the patient write things from memory? This is associational or mnemonic writing. Here he cannot very

well. He can write his name, but he has marked difficulty in writing the alphabet, and cannot write the Lord's Prayer, which he can repeat fluently; thus showing that here the defect is in the visual word-centre itself, and not that it is prevented from acting by a defect in the auditory word-centre.

(c.) Can the patient copy words—imitative writing? He can do so very accurately, copying either printing or writing, or transferring one to the other. He can also copy easy drawings exceedingly well, considering his abilities.

III. *Auditory and Visual Word-Centres Combined.*

We have two ways of testing whether these centres can act in unison, and therefore whether their commissural fibres are intact.

(1.) Can the patient read aloud? In doing this the visual word-centre receives a stimulus along its sensory in-going fibres, and passes it along the commissure to the auditory word-centre, where it calls up the corresponding sound, the stimulus to utter which passes along the out-going fibres to the kinæsthetic centre, and finally to the muscular nerves. This man *can read aloud with perfect ease, reading long and difficult words clearly and distinctly*. The fact that he can read aloud and yet cannot name objects shows that there must be a visual word-centre, as the auditory word-centre can be stimulated by the reception of impulses from it, but cannot be roused into activity by volitional impulses originated on seeing the object.

(2.) Can the patient write from dictation? This process is the reverse of the preceding, the sensory stimulus reaching the auditory word-centre, and going thence to the visual word-centre along commissural fibres belonging probably to another and a distinct set. In this case the patient has considerable difficulty in writing from dictation, only being able to write simple words, and not always these. Sometimes I have noticed that he was able to write a word spontaneously which he could not write from dictation, but this was not a constant or uniform condition.

We are now met with this problem: If he can read aloud, the commissural fibres must be intact; and if he cannot write

from dictation, they must be damaged. How can we reconcile these contrary propositions?

There are two explanations available :—

I. That there is a double set of commissural fibres—one the audito-visual, and the other the visuo-auditory ; and, further, that one of these can be damaged and the other left intact.¹

II. That after some time the impulses from the visual word-centre, instead of going to the auditory and then to its related kinæsthetic centre, go direct to this latter kinæsthetic centre, passing by the auditory centre. But if the visuo-auditory fibres can be superseded like this, why should not the audito-visual be similarly superseded? In reply we can only make this suggestion, that the auditory word-centre having so much more to do than the visual, it would be an obvious advantage if it could be relieved from transmitting these commissural impulses by their going direct to the kinæsthetic centre. It seems possible that in some people this may be brought about by education and practice, though in the case of a man in the position of this patient, such an explanation would seem hardly likely to be the correct one.

To sum up, then, we find that in this case there is—

I. Some aphasia, though this is much less than it was.

II. Some paralytic amnesia, viz.,—

(a.) As regards the auditory word-centre :—

1. Diminished excitability to volitional impulses (spontaneous speech).
2. Normal excitability to associational impulses (reading aloud).
3. Diminished excitability to sensory impulses (imitative speech).

(b.) As regards the visual word-centre :—

1. Diminished excitability to volitional impulses (spontaneous writing).
2. Diminished excitability to associational impulses (writing from dictation).
3. Normal excitability to sensory impulses (imitative writing).

¹ On this subject see Dr. Bastian's 'Brain as an Organ of Mind,' 3rd ed. p. 640.

III. Some inco-ordinate amnesia extending to the same parts as are affected by the paralytic forms.

Therefore the lesion has damaged the auditory word-centre and the audito-visual commissural fibres, and to a less extent the visual word-centre.

As to the nature of the lesion, I should think that it was probably a thrombosis affecting a small area in the region of these centres as described above.

Note, October, 1885.—It is now more than eighteen months since the attack, and the patient is in very much the same condition. He has learnt some more words, and has a little more power in recovering names, but only after considerable delay and many failures. His general health is very good; his grip is, right 85, left 80; and there remains only a slight trace of the right facial paralysis.